Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

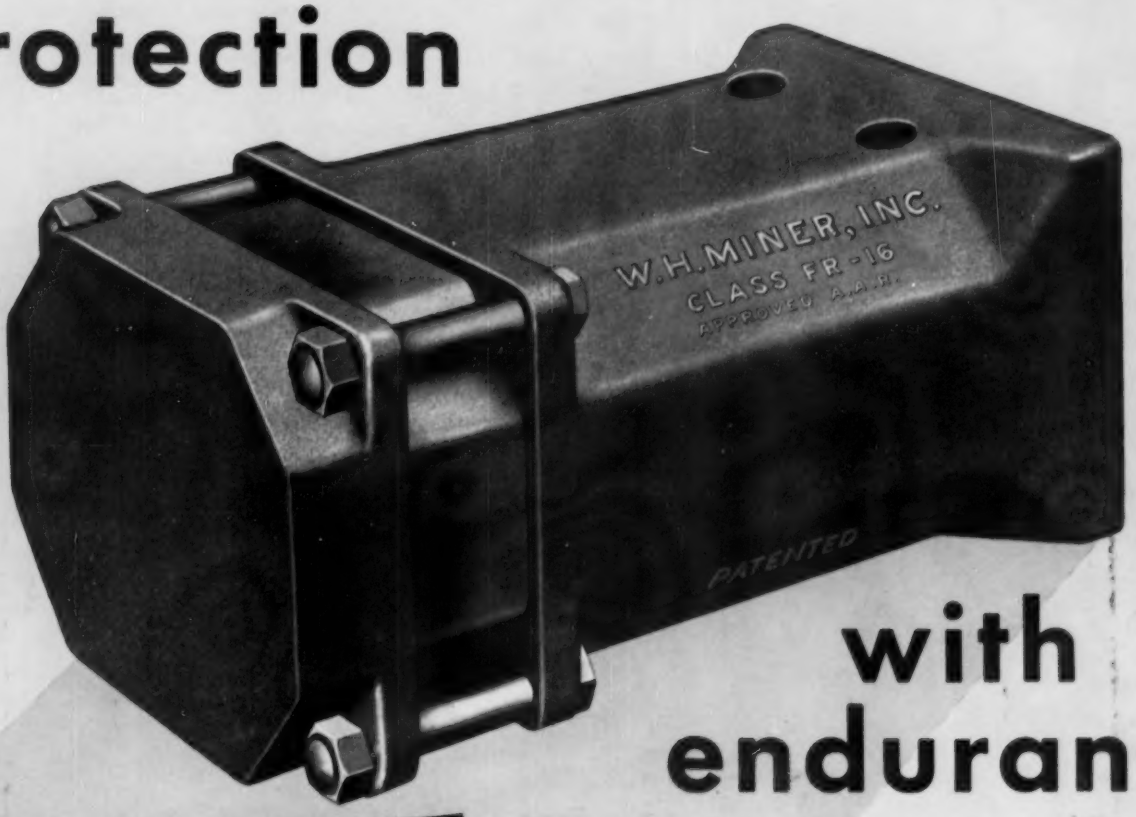
NOVEMBER 1956

One of Five Specialized Railway Age Publications

PROTECTING MORE AND MORE CARS

WITH INEXHAUSTIBLE ENDURANCE

protection



with endurance

MINER
FR-16
RUBBER DRAFT GEAR

W. H. MINER, INC.
CHICAGO

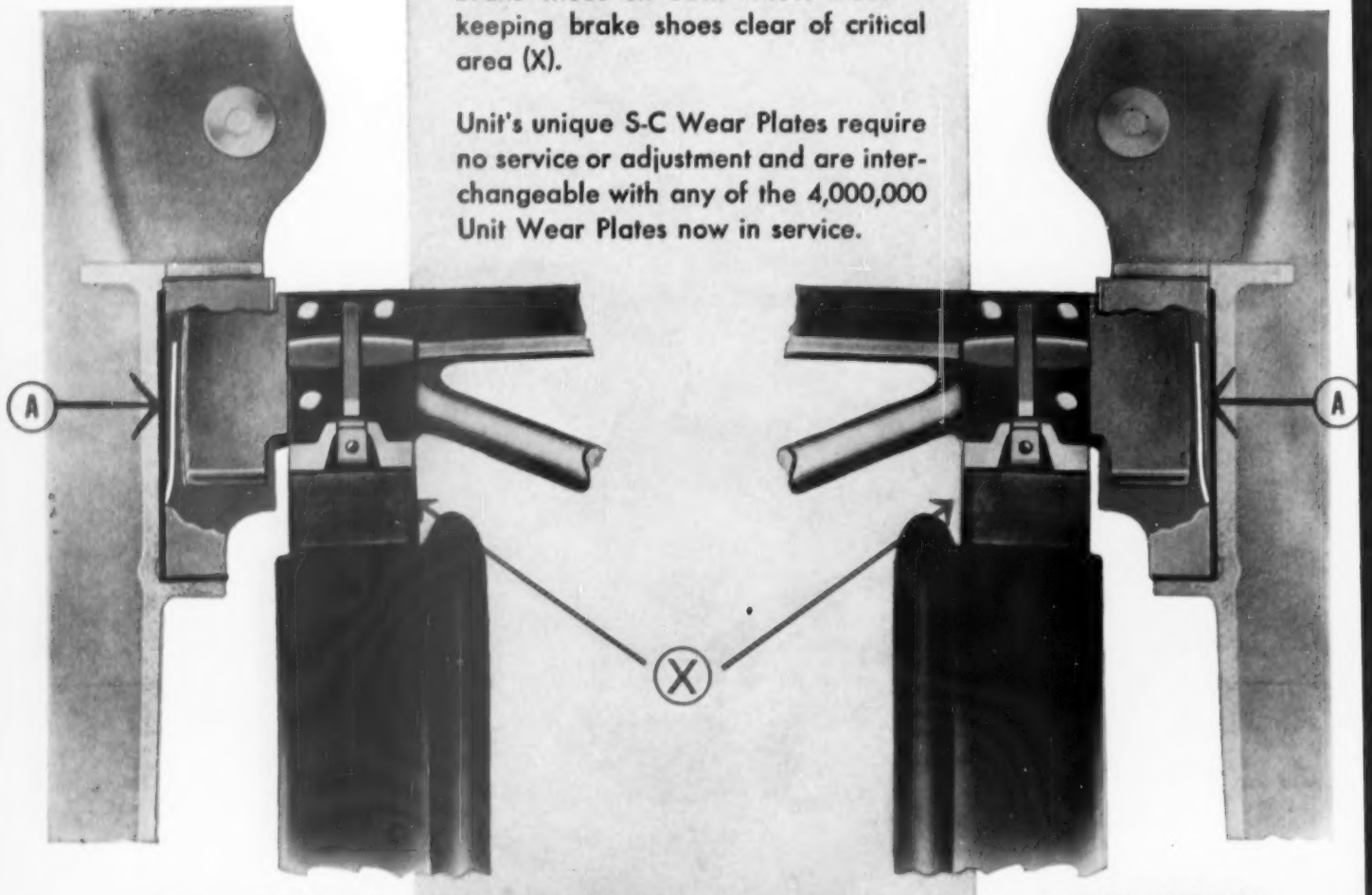
S-C FOR FINER UNIT PERFORMANCE

IN THIS CRITICAL AREA

When lateral movement of a brake beam brings either brake shoe into this critical area *it is riding the wheel flange*—one of the major causes of flange and brake shoe wear.

In a Unit Truck equipped with S-C Wear Plates, rugged built-in springs (A) automatically set up the compensating force needed to re-position the brake shoes on each wheel tread—keeping brake shoes clear of critical area (X).

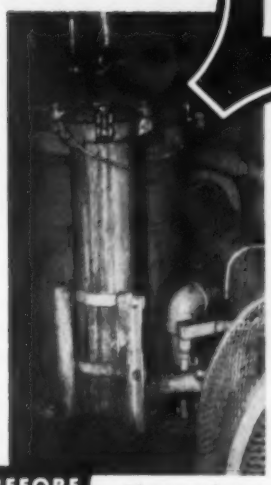
Unit's unique S-C Wear Plates require no service or adjustment and are interchangeable with any of the 4,000,000 Unit Wear Plates now in service.



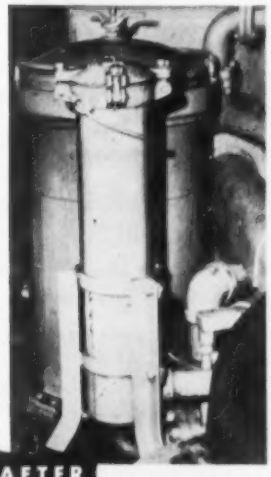
UNIT TRUCK CORPORATION **NEW YORK**

FRISCO

Keeps Diesel Interiors "Clean-as-a-Whistle" with Oakite Composition No. 72



BEFORE Photo shows diesel filter units before spray-cleaned with Oakite 72.



AFTER Same units showing efficiency of Oakite spray-cleaning and rinsing.

Sticklers for absolute cleanliness, FRISCO keeps its diesel engine rooms spotless. They know that cleanliness contributes importantly to mechanical operating efficiency and safety.

FRISCO uses Oakite Composition No. 72 for this important maintenance operation because...

Oakite Composition No. 72 is

SAFE	**It's water-mixed... safe for personnel and paint**
SPEEDY	**Superior wetting action speeds soil penetration and removal**
ODORLESS	**Pleasant to use even in confined cab areas**
VERSATILE	**Use it for washing diesel interiors, exteriors, coaches, headlinings, sidelinings.**
SAVES	**storage space, reduces inventory**
ECONOMICAL	**Water-mixed solutions cost just pennies per gallon**

And, in addition to Oakite 72, FRISCO uses Oakite 19 for parts cleaning; Oakite 61 for filter conditioning; Oakite 20 for steam cleaning diesel engine bases; Oakite 88 for mechanical coach washing.

For complete story on money-saving Oakite Cleaning send for FREE Booklet "How to make sure of the best in Railroad Cleaning." Oakite Products, Inc., 46 Rector Street, New York 6, New York.

OAKITE

RAILWAY DIVISION

New Coupling Eliminates Spillage When Fueling Diesel Locomotives

Fuel line connection and disconnection is quick and easy, with no loss of fuel from either hose or tank port.

Coupling in connected position. Note that use of the coupling eliminates need for any type of fueling valve.

Aeroquip Self-Sealing Diesel Fueling Coupling allows full flow when connected. Each half seals without loss of fuel when disconnected. It offers these important advantages:

- eliminates fuel loss on connection and disconnection of hose, prevents dripping from fuel port and hose.
- combined with Koehler automatic valve, it prevents fuel spillage from tank overflow, fills tank only to desired level.
- eliminates need for hand shut-off valve on fueling hose line.
- connects and disconnects quickly to save time on refueling stops.
- eliminates fire hazard caused by fuel spillage around passenger platforms, reduces fire prevention costs.
- saves on direct fuel costs by eliminating fuel losses.

Aeroquip is sole distributor of the Koehler Automatic Shut-off Valve which can be used with the new Diesel Fueling Coupling. Mail coupon today for full information.

Aeroquip Corporation, Jackson, Michigan

Please send me full information on Aeroquip Diesel Fueling Coupling and Koehler Automatic Shut-off Valve.

Name_____

Title_____

Company_____

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Aeroquip

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

NOVEMBER, 1956 VOLUME 130, No. 11

EDITORIALS 51

SP DUAL FUEL OPERATION 55

MECHANICAL REFRIGERATION—Part III 60

COORDINATED MECHANICAL ASSOCIATIONS MEETINGS 64

ELECTRICAL SECTION

Steam Generators Put Through Paces 78

Don't Test Your Luck 80

New Haven Train X Locomotives Merge Diesel and Third Rail Operation 81

How Relay Failures Can Be Reduced 85

DEPARTMENTS

Equipment . . . New Ideas—New Uses 4

News 6

Questions and Answers 92

Personal Mention 94

Supply Trade Notes 100

Index to Advertisers 122

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High Potential Tester For Electrical Shops

Model 437 Mobile Type D.C. Hypot is an instrument for use in testing insulation strength. The device finds many applications in determining insulation leakage before failure, as well as high potential breakdown voltage. Continuously variable output from 0 to 45 kv at maximum current of 2.5 ma can be read clearly on triple scaled meters. The tester requires 115 volts a-c, 60 cycles as input. It is contained in a mobile case, mounted on rubber tired wheels. *Western Railroad Supply Company, Dept. RLC, 2428 South Ashland avenue, Chicago 8.*

High-Pressure Oil Gun

With this hand-operated device it is possible to have positive pressure lubrication with oils as well as flushing and cleansing of bearings which require periodic applications of fluid lubricant.

Metal rings anodized in various colors, are used with the pressure oil gun. They are slipped over the head of each fitting to provide a color-coding system for all bearings requiring oil. The rings make accidental use of a grease gun impossible. *Lincoln Engineering Company, Dept. RLC, 5702-14 Natural Bridge ave., St. Louis 20.*

Pre-Paint Cleaner

Permacel 340 Bite is a new pre-paint cleaner designed specifically for the removal of waxes and silicones prior to repainting.

Used prior to repainting, Bite, it is said, cleans a surface by dissolving oil, grease, gummy substances, wax and silicones, while at the same time microscopically etching the surface so that the new finishing materials will bond properly. Bite is available in quart, and gallon cans and in five-gallon drums. *Permacel Tape Corp., Dept. RLC, New Brunswick, N.J.*

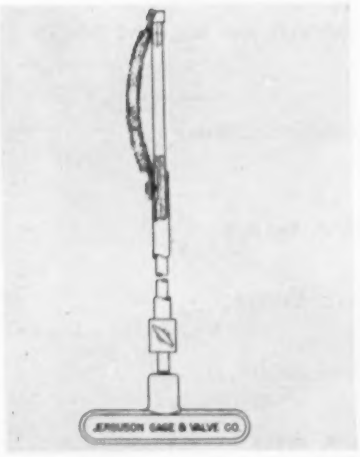
Cutter For Hose Clamps

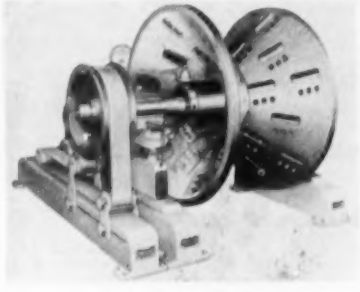
Punch-Lok hose clamps may now be removed with less effort according to the manufacturers. This 14-in. long tool is drop-forged hi-carbon steel and features a single cutting jaw (with slip land to prevent gouging of the hose) while the other jaw works as a butt edge, backing up the cutter. It has a heavy riveted, single pin joint and comes in a black and grey enamel finish. *Punch-Lok Company, Dept. RLC, 321 Justine st., Chicago 7.*

Gage Glass Cleaning Rod

This device, for cleaning the inside of liquid gage glasses, employs a cloth swab which can be brought to bear against the inside of the glass to remove stains, etc.

In operation, a tubular cloth swab is slipped over a piece of corrosion-resistant spring steel on the end of the rod. A detergent or other cleaning medium is applied to this swab and the rod inserted into the end connection of the gage or the drain in the offset of a valve. The rods are manufactured in standard lengths of 36 in. Longer lengths can be ordered. *Jerguson Gage & Valve Co., Dept. RLC, 80 Fellsway, Somerville 45, Mass.*





Balancing Machine

Pedestal type design permits these Mogul units to be placed together or separated according to the length of work piece to be balanced. They are adaptable to the shortest rotors or the longest type of paper mill guide roll. The drive unit may be positioned at either end or in the center, as individual needs dictate.

To locate and measure conditions of small, as well as large unbalance, the balancer employs a true seismic free-in-space unbalance indicator attached to work supporting mountings on chrome balls and raceways.

Its use in combination with variable speed power drives enables the operator to correct unbalance at low speeds. Universal V-type bearings are said to eliminate time consuming, making and fitting of half bearings. *Raydyne Corporation, Dept. RLC, 920 West Laurel street, Springfield, Ill.*

(Turn to page 103)

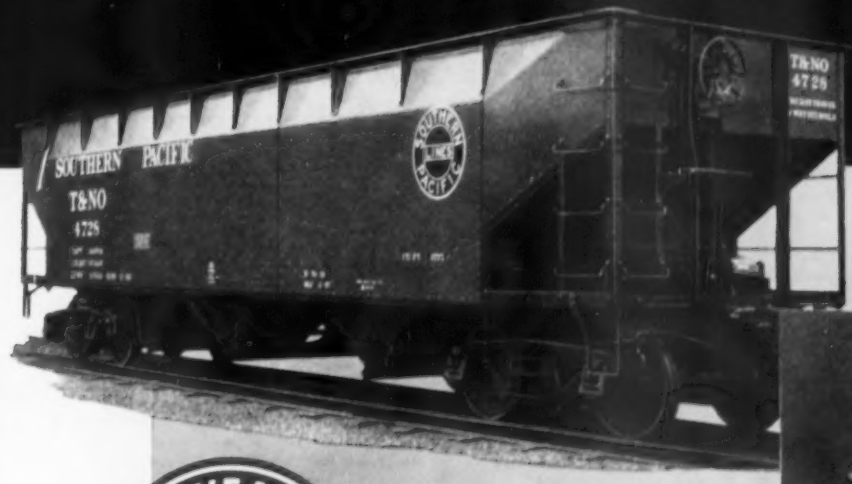
Type D Mechanism
(Operative from one side)
in Closed and Locked Position

ENTERPRISE

Patented

Type D

Door Operating Mechanisms for Hopper Cars



Type D Mechanism
(Operative from either side)
in Closed and Locked Position

50 YEARS
ENTERPRISE
1905-1955

ENTERPRISE RAILWAY EQUIPMENT COMPANY

59 E. Van Buren Street • Chicago 5, Illinois

ASME Annual Meeting

The Railroad Division of the American Society of Mechanical Engineers will hold joint sessions with the Nuclear Engineering and Oil and Gas Power Divisions, respectively, as well as a single railroad session, during the annual meeting of the society at the Statler and the Sheraton-McAlpin Hotels, New York, November 25-30, inclusive. The theme this year is "Free Exchange of Knowledge—The Path to the Future." The 22nd National Exposition of Power and Mechanical Engineering, under the sponsorship of the ASME, will be held simultaneously at the New York Coliseum.

The program for the Railroad Division sessions is as follows:

WEDNESDAY, NOVEMBER 28

2:30 pm

RAILROAD (I)—NUCLEAR ENGINEERING (III)

Progress in Railway Mechanical Engineering 1955-1956.

A Progress Report on the Development of an Atomic-Powered Locomotive, by B. C. Gunnell, Bush Hill Development Corp.

The Use of Atomic Energy in the Testing of Materials, by W. M. Keller, Central Research Laboratory.

THURSDAY, NOVEMBER 29

9:30 am

RAILROAD (II)—OIL AND GAS POWER (IV)

The Hydromechanical-Drive Diesel for High-Speed Ultra-Lightweight Passenger Trains.

Two Dual-Powered High-Speed Locomotives for a New Haven Lightweight Passenger Train, by R. Aldag, Fairbanks, Morse & Co., and F. L. Sahlmann, General Electric Co.

Air Brakes for High-Speed Ultra-Lightweight Passenger Trains, by T. H. Bickerstaff, supervisor air brakes, Atchison, Topeka & Santa Fe.

12:30 pm

RAILROAD DIVISION LUNCHEON

Speaker: William White, president, Delaware & Hudson. Subject: The Current Railroad Scene.

2:30 pm

RAILROAD (III)

The Combination Vehicle as a Special Freight Car for Industry.

The Effect of Improved Draft Gears and Spring-Dampened Trucks on Freight-Car Shops, by H. W. Faus, retired engineer locomotive equipment, New York Central System.

Trailers in Piggy-Back Operation from a Manufacturer's Point of View, by J. J. Black, Trailmobile, Inc.

Papers on the Development of a Supercharged Medium-Speed Two-Cycle Opposed Piston Engine, by A. K. Antonsen, Fairbanks, Morse & Co.; Design and Development of a Two-Cycle Turbocharged Diesel Engine, by P. J. Lozecky, General Motors Corp.; Future Development of the High-Speed Diesel Engine, by Ernest Chatterton, D. Napier & Son, Ltd., London, and on Torque Converters—a Versatile Drive, by H. L. Wilke, National Supply Company, will also be presented at morning and afternoon sessions of the Oil and Gas Power Division Wednesday, November 28. At a Safety session on Friday morning, November 20, J. B. Skinner of the American Mutual Liability Insurance Company will present a paper on the Toxicity of Materials of Interest to the Mechanical Engineer.

The Outlook for Fuels is the topic for a Fuels-Power session on Tuesday morning, November 27. The "New Look" for Fuels and Power will also be discussed at a Fuels Luncheon on the same day.

The annual banquet will be held Wednesday evening, November 28.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE OCTOBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road and builder	*No. of units*	*Horsepower*	*Service*	*Other detail*
BOSTON & MAINE:				
Electro-Motive	50	1,750	All purpose	Approx. total cost, $9,000,000. Delivery scheduled to begin in February; completed by November.
NORFOLK & WESTERN:				
Electro-Motive	30	1,750	General purpose	Approx. cost, $6,000,000. Deliveries expected to start next May

FREIGHT-CAR ORDERS

Road and builder	*No. of cars*	*Type*	*Cap., tons*	*Other detail*
CHESAPEAKE & OHIO:				
ACF Industries	2,000	Triple hopper	70	Delivery to begin in June 1957.
GULF, MOBILE & OHIO:				
Pullman-Standard	250	Box	..	.....
Greenville Steel Car	100	Covered hopper	..	.....
Company shops	250	Wood rack	..	.....
DELAWARE & HUDSON:				
Pullman-Standard	10	Covered-hopper	70	For delivery during November.
Greenville Steel Car	65	Covered-hopper	70	Deliveries to start in March. 75 cars to cost $625,000.
MINNEAPOLIS & ST. LOUIS:				
Pacific Car & Fdry	30	Box	..	50-ft, insulated, with compartmentizers. Delivery scheduled for second quarter 1957.
ACF Industries	250	Hopper	..	.....
Pullman-Standard	100	Covered hopper	..	.....
NEW YORK, CHICAGO & ST. LOUIS:				
Greenville Steel Car	100	Covered hopper	70	All equipped with roller bearings. Deliveries expected to start next March. Cost, about $890,000.
NORTH AMERICAN CAR CORP.:				
Greenville Steel Car	75	Covered hopper	..	Estimated cost of these 125 covered hopper cars, $1,000,000. Delivery scheduled for second quarter of 1957. North American also has increased a previous order for 25 covered hoppers given P-S 6o 75.
Pullman-Standard	50	Covered hopper	..	
ACF Industries	100	Tank	..	Delivery first quarter 1957.
READING:				
ACF Industries	100	Covered hopper	70	Cost, over $850,000. Deliveries expected next April.

INQUIRIES AND NOTES

FREIGHT CARS:

Central of Georgia.—Plans purchase of 250 covered hopper cars at approximate cost of $2,250,000 for delivery in August 1957.

Seaboard Air-Line.—Has requested bids for 900 gondola cars, 700 open-topped hopper cars, 500 cement cars and 300 pulpwood cars. Pulpwood cars and 200 of gondola cars will be equipped with roller bearings.

Southern Pacific.—Is proceeding with construction in company shops of 150 new 79½-ft piggyback flat cars under plan reported in February issue. Cars being built under license from Piggyback, Inc. Cost, $1,750,000.

Wheel and Axle Research

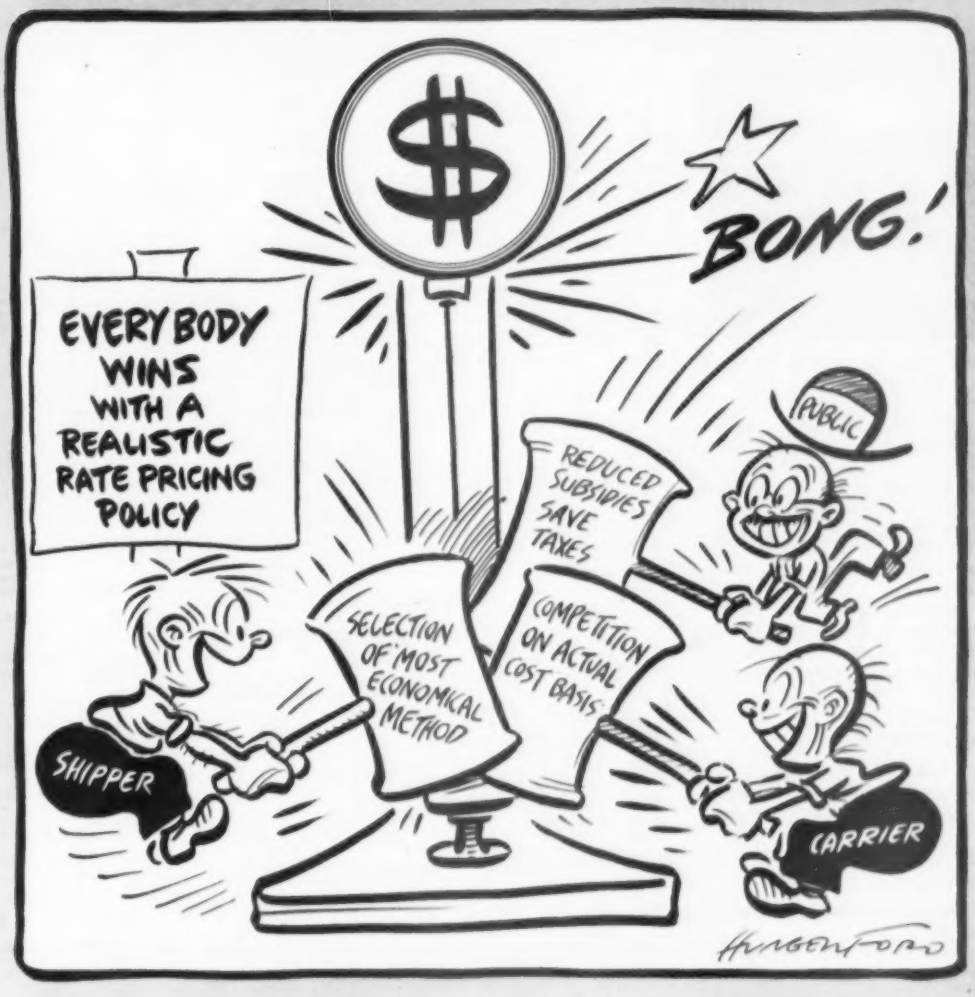
What is said to be the world's largest inertia dynamometer for laboratory testing of full-scale railroad wheels is operating at U.S. Steel's Applied Research Laboratory, a division of the new Research Center, in Monroeville, Pa., Standard railroad wheels from 30 to 48 in. in diameter can be tested under normal or exaggerated conditions, simulating factors of loading, braking and tracking encountered in actual service.

The dynamometer consists of a 450-hp mill-type electric motor, a variable-weight fly wheel, a track wheel, a spring leading device, a braking mechanism, ultra-modern instrumentation and both automatic and manual controls. The entire device, a two-story installation of about 125 tons of steel-reinforced concrete and 100 tons of machinery, rests on a mounting specially designed to reduce vibration to a minimum. The bulk of the installation is below ground.

When rotating at top speed, a maximum

let competition decide

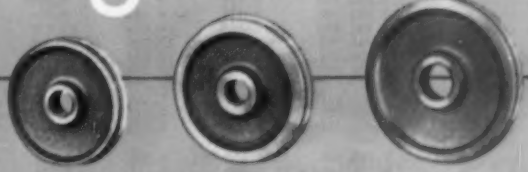
by Hungerford



We will be glad to send you enlarged copies of this Hungerford cartoon (without advertising copy) for posting on your office and shop bulletin boards, or a cut for your company magazine, at cost.

Edgewater

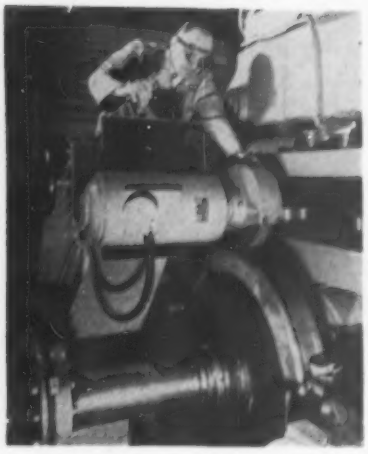
Rolled Steel Wheels



for Freight Cars Passenger Cars Diesel Locomotives

Edgewater Steel Company

PITTSBURGH 30, PA.



Adjusting the grinder for dressing the tread on a wheel to be tested

energy of 68,500,000 ft-lb can be imparted to the test wheel. Tests may be conducted at more than twice the kinetic-energy levels encountered in modern railroad service. Another feature of the machine is the ability to simulate the loading and tracking of a wheel on a rail. The dynamometer can also be used for fatigue testing of standard railroad axles.

The new installation will be used not for quality control but as a research tool for the development of railroad wheels of improved composition and mechanical design.

Missabe To Build Diesel Shop at Proctor

The Duluth, Missabe & Iron Range will build a new diesel repair shop at Proctor, Minn. The cost is estimated at $1,600,000.

Third Product Development Contest

Prizes of $1,000, $750, $400, $200 and $100 are being offered in each of two classes in the third Product Development Contest of the Steel Founders' Society of America. Class I includes all persons not employed by the steel castings industry and Class II covers its employees. The contest closes Midnight, June 1, 1957.

The subjects to be covered are functional analysis, engineering a steel casting, redesign of a steel casting, cast-weld, composite-weld, close tolerance steel castings, improved steel castings performance, treatment of a steel casting, manufacturing operations, administrative factors, inspection, and steel castings in use.

Information concerning the contest can be obtained by writing the Product and Market Development Committee of the Steel Founders' Society of America, 606 Terminal Tower building, Cleveland 13.

Lubricators Must Receive Periodic Attention

Cars with journal lubricating devices must not operate beyond the mandatory 18-months' repack period without attention, unless permission has been granted by the AAR Mechanical Division. According to the Division, some cars have been operat-

(Continued on page 94)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of July		7 months ended with July	
		1956	1955	1956	1955
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	2,812	5,736	27,263	36,350
3-06	Total, Diesel-electric	35,620	35,992	259,883	243,337
3-07	Total, electric	682	747	5,094	5,103
3-04	Total, locomotive-miles	39,397	42,711	293,922	286,273
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,521	1,682	11,686	11,393
4-06	Empty, total	939	928	6,575	6,334
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	6,508	13,193	67,837	84,015
6-02	Total in oil-burning steam locomotive trains	1,102	2,850	7,114	12,866
6-03	Total in Diesel-electric locomotive trains	99,764	101,178	744,265	687,251
6-04	Total in electric locomotive trains	2,040	2,265	15,601	15,636
6-06	Total in all trains	110,439	120,242	840,872	804,736
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.03	1.03	1.02
10-02	Loaded freight car-miles	41.2	42.4	42.7	42.7
10-03	Empty freight car-miles	25.5	23.4	24.0	23.7
10-04	Total freight car-miles (excluding caboose)	66.7	65.8	66.7	66.4
10-05	Gross ton-miles (excluding locomotive and tender)	2,992	3,032	3,070	3,016
10-06	Net ton-miles	1,309	1,376	1,398	1,358
12	Net ton-miles per loaded car-mile (M-211)	31.8	32.4	32.8	31.8
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	61.8	64.4	64.0	64.3
14	Averages per train hour (M-211):				
14-01	Train miles	18.8	18.6	18.7	18.8
14-02	Gross ton-miles (excluding locomotive and tender)	55,644	55,638	56,678	56,134
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	43.2	46.5	46.6	46.2
14-02	All	41.5	44.1	44.8	43.5
15	Average net ton-miles per freight car-day (M-240)	815	923	940	889
17	Per cent of home cars of total freight cars on the line (M-240)	44.6	43.0	42.1	47.7

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	708	1,502	5,515	9,870
3-06	Diesel-electric	20,895	21,065	142,481	142,060
3-07	Electric	1,226	1,307	8,843	9,223
3-04	Total	22,830	23,875	156,840	161,100
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	239,896	250,990	1,618,168	1,642,083
4-09	Total in coal-burning steam locomotive trains	4,364	8,369	33,505	56,012
4-10	Total in oil-burning steam locomotive trains	1,457	5,357	11,520	29,200
4-11	Total in Diesel-electric locomotive trains	219,447	222,548	1,467,655	1,451,179
12	Total car-miles per train-mile	10.07	10.12	9.89	9.80

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	159,269	293,352	1,657,241	1,887,741
1-02	Steam, oil-burning	32,141	53,661	211,760	322,172
1-03	Diesel-electric[1]	3,377,246	3,717,075	26,508,844	24,982,830
1-06	Total	3,572,685	4,070,374	28,401,348	27,238,866
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	4,546	7,267	41,544	61,109
2-02	Steam, oil-burning	3,922	4,135	22,620	34,369
2-03	Diesel-electric[1]	248,626	248,987	1,733,869	1,705,476
2-06	Total	281,175	286,464	1,974,098	1,980,546
3	Hours per yard locomotive-day:				
3-01	Steam	5.0	5.9	6.1	5.3
3-02	Diesel-electric	13.9	15.5	15.7	15.4
3-05	Serviceable	13.9	15.2	15.7	15.1
3-06	All locomotives (serviceable, unserviceable and stored)	12.7	13.6	14.2	13.3
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.64	1.67	1.68	1.65
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.72	.71	.75	.75

[1]Excludes B and trailing A units.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
July, 1952	2,575,299	10,566	15,833	26,399	97,553
July, 1953	2,925,317	9,342	15,775	25,117	116,467
1954					
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444
1956					
January	2,925,109	2,029	4,302	6,331	462,029
February	2,794,161	2,570	5,611	8,181	341,542
March	3,027,684	2,517	6,212	8,729	346,853
April	2,930,389	3,202	6,881	10,083	290,626
May	3,063,427	4,672	10,903	15,575	196,688
June	2,973,732	6,777	15,125	21,902	135,774
July	2,788,347	8,484	16,067	24,551	113,573

SAND THE TRACKS . . .

NOT THE BEARINGS

IN A SINGLE RUN FROM NEW YORK TO CHICAGO A DIESEL ENGINE CAN PICK UP ENOUGH GRIT . . .

to ruin it!

The GRIT is there . . . the engine picks it up . . . NOW, IT'S UP TO THE FILTER TO CONTINUOUSLY REMOVE IT! Abrasive substances are the enemy of operating costs and operating schedules. In bad weather they're useful on the *tracks,* but in lubricating or fuel oil—they spell disaster.

WIX Oil Filter Cartridges are the sound answer to the menace of oil contamination. WIX has studied the problem . . . conducted the continuous research to KNOW the answers . . . engineered filter cartridges specifically for railroad diesel service to provide maximum "engine-wear insurance."

Write for the WIX Railroad catalog and particulars on how you, too, may have a specialized study made on your oil filtration problems.

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ENGINEERED FILTRATION

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Railroad Dept. R.L.C.
Gastonia, N. C.

Please send catalog and particulars on your special oil filtration study.

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Company_____

Address_____

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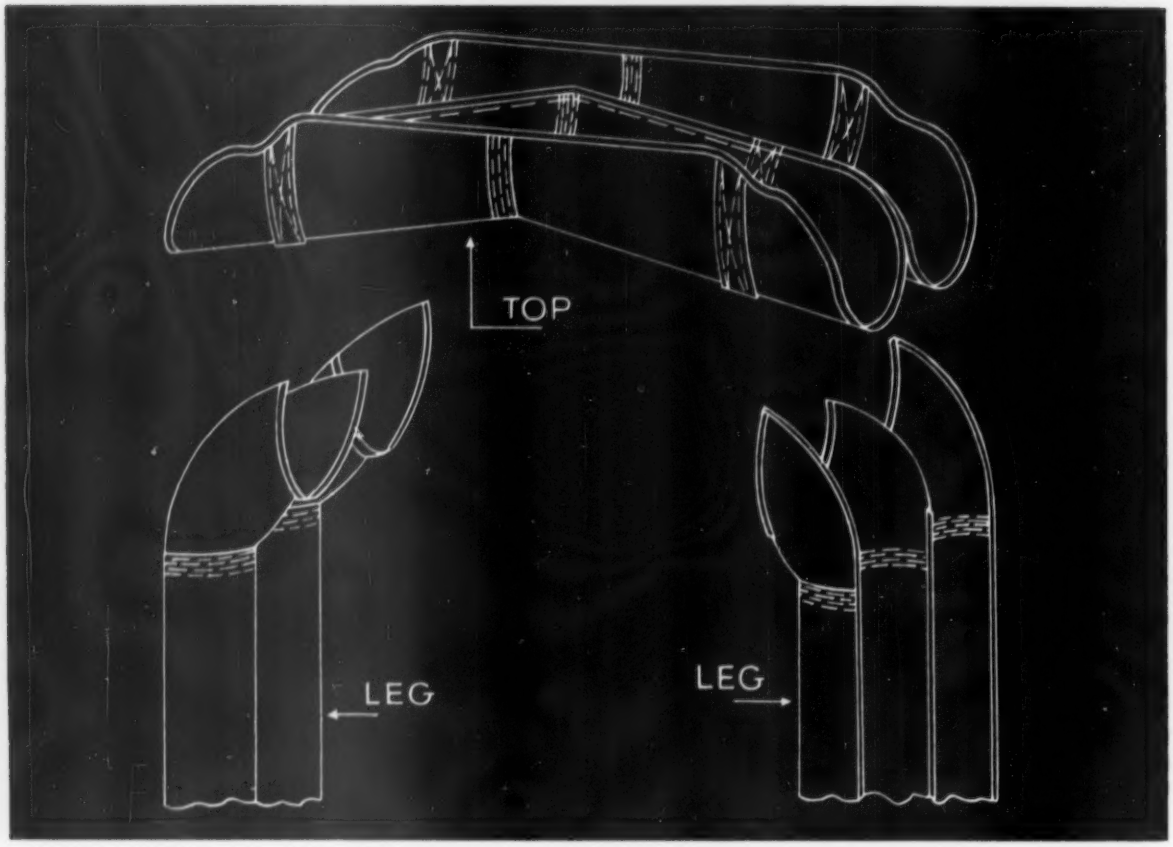
You can see the advantages of Adlake

sectional!

diaphragms!



Top and legs are separate units! Gives flexibility for longer life...prevents tearing at corners.

Replaceable sections! Damaged sections can be replaced without replacing entire diaphragm. Cuts maintenance costs!

Sloping top drains water! Rain, snow, dirt, etc. are carried off quickly, thus prevents collected moisture.

New special belting! Developed especially for Adlake Diaphragms. Gives longer life, resists detergents used for car washing.

For the full story on Adlake Diaphragms, write The Adams & Westlake Company, 1152 N. Michigan, Elkhart, Indiana. No obligation, of course.

Adlake 99th year of serving the transportation, building and control industries

THE Adams & Westlake COMPANY

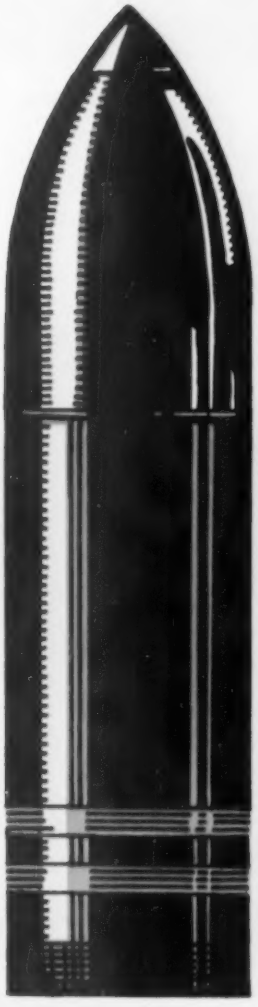
New York • Elkhart, Indiana • Chicago

Established 1857

Manufacturers of ADLAKE Specialties and Equipment for the Railroad Industry

To ship

AMMUNITION



the UNITED STATES NAVY uses 2,020 cars shock proofed with WAUGH

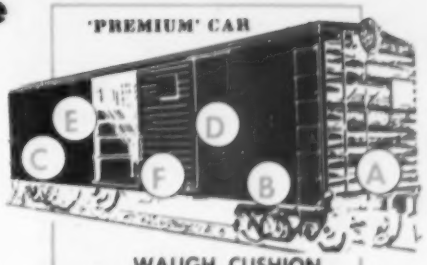
Cushion Underframe

and Duryea Cushion Underframe

'PREMIUM' signifies premium performance and savings in both maintenance and lading damage costs. Today no progressive railroad can afford not to supply shippers with 'premium' cars. It is the car that wins shippers' good-will, puts premium traffic back on the rails and enables railroads to earn more per ton-mile.

The 'premium' car is the standard car of tomorrow proven and available now.

'PREMIUM' CAR

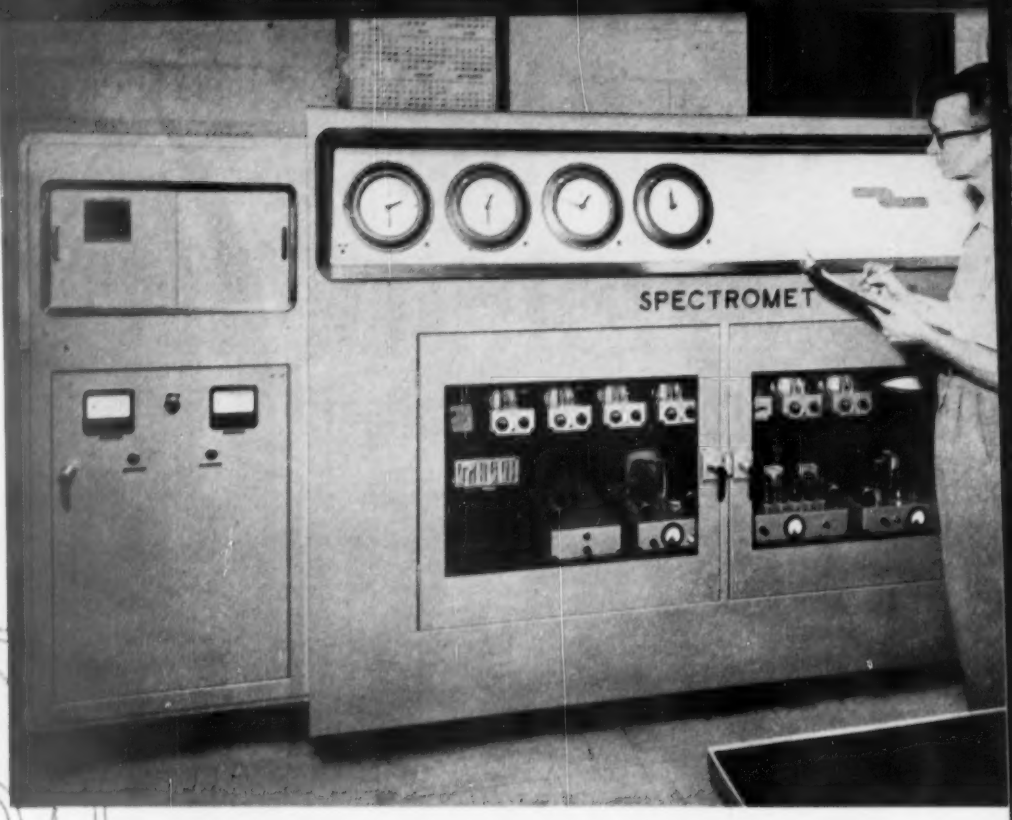


A WAUGH CUSHION UNDERFRAME
B IMPROVED TRUCKS
C IMPROVED BEARINGS
D WIDE DOORS
E LOAD RETAINERS
F SURFACED FLOOR

WAUGH EQUIPMENT COMPANY

New York, Chicago, St. Louis. Canadian Waugh Equipment Company, Ltd., Montreal

The Spectromet direct reading spectrometer, installed in the melting department, gives accurate analysis of the molten steel up to the moment of pouring.



QUALITY CONTROL

Makes Southern® Cast Steel Wheels Dependable

Ingredients of molding sand are metered out in electronically controlled mullers. Below, a sand tester checks the quality and strength of sand used in making hub cores.

A-2240

Latest production equipment, modern precision instruments, and rigid inspection procedures maintain quality standards that spell top wheel value and long service life.

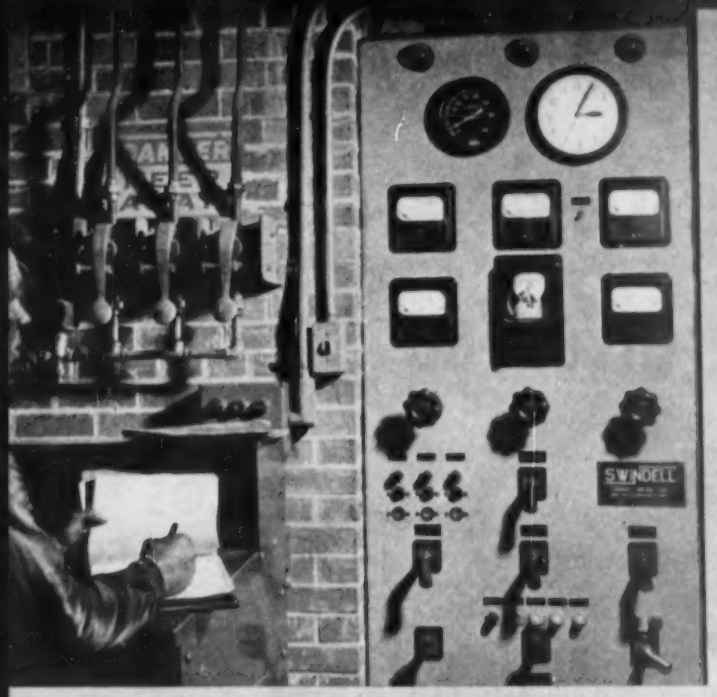
As everyone familiar with foundry practice knows, significant advances in metallurgy cannot be fully realized unless positive control is exercised over every step in the production process.

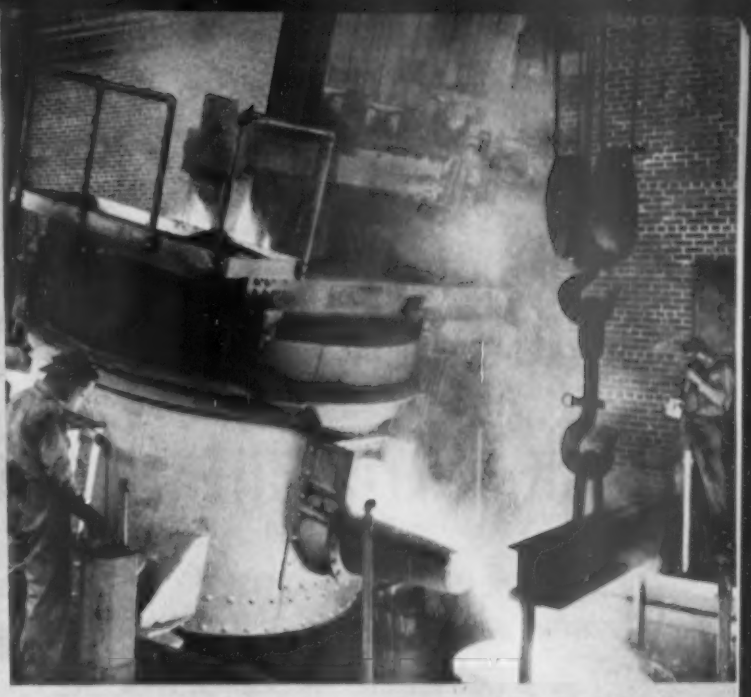
Consider, then, the numerous *quality control* steps that are employed in the manufacture of the new Southern cast steel wheel. Developed and produced for today's and tomorrow's most exacting freight service, this metallurgically unique 1.5% carbon wheel benefits from these and other top quality techniques:

Electronically controlled sand conditioning. Dielectric core ovens. Electric furnace melting with automatic recording pyrometers. Spectrographic analyses of every heat. Double heat-treatment, again automatically controlled. Tensile, hardness, and Magna-Glo tests. Shotblast for easy visual inspection. Automatic control of all machining operations.

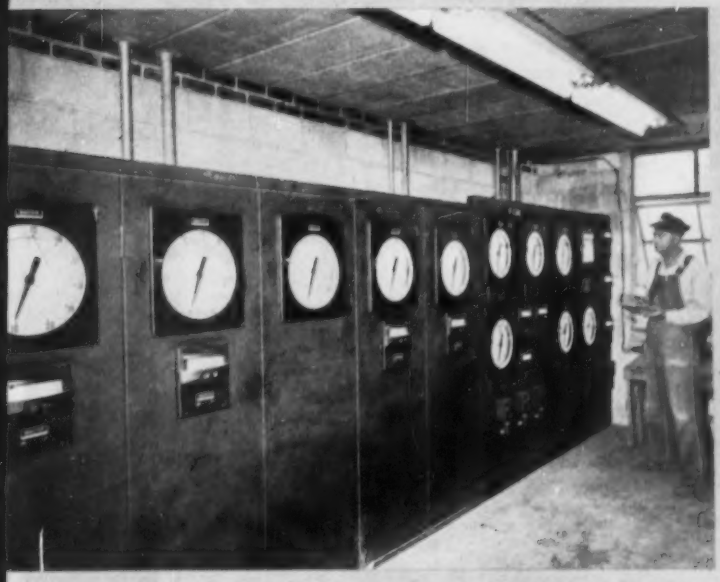
No reasonable expenditure has been spared, no corner cut, no compromise made in producing this 1.5% carbon cast steel wheel. The result? Utmost uniformity, both metallurgically and dimensionally. Utmost safety and stamina for severest service. Utmost *value* for your freight car wheel dollar!

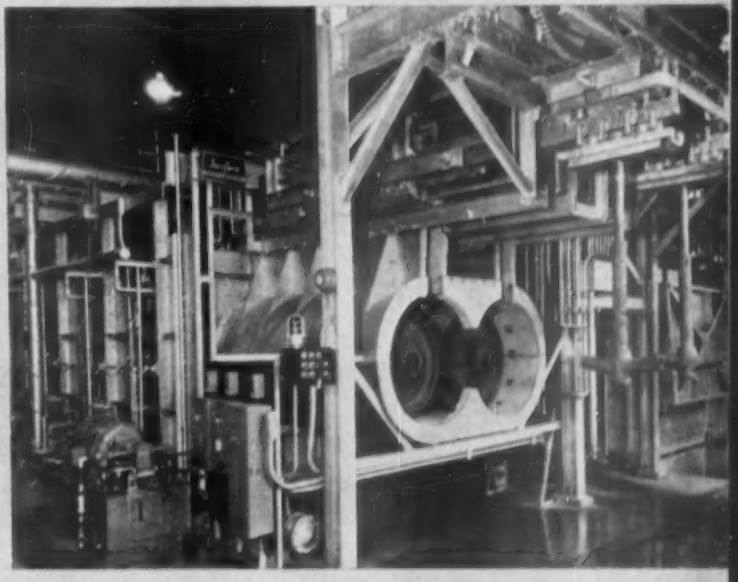
American Brake Shoe Company, Southern Wheel Division, 230 Park Avenue, New York 17, New York.





Four electric arc furnaces of the latest type maintain uniformity of steel analysis. Each furnace has a separate power supply and a control panel incorporating some of the most precise sensitive recording instruments.





After being slowly cooled in annealing pits, wheels are subjected to electronically controlled two-stage heat treatment. Below, left, special laboratory equipment gives quick determination of carbon. At right, all finished surfaces are machined at a single chucking on special automatic vertical turret lathes. This produces an inherently true, well balanced wheel of exceptional dimensional accuracy.

General Electric Parts Centers are Ideally Located to Give You Quick, Efficient Service

General Electric Railroad Regional Parts Centers are now located at five key points in the United States to provide convenient, prompt, and dependable parts service to those railroads operating General Electric locomotives and equipments.

Replacement parts, including Unit Exchange components, are warehoused at each Regional Parts Center so that your parts requirements may be quickly serviced. The Center serving your area has the latest design General Electric replacement parts in stock which permits you to carry a minimum inventory and to save transportation time and expense.

Each of the G-E Parts Centers is staffed by experienced personnel familiar with all phases of General Electric locomotive and equipment parts replacement. General Electric locomotive Parts Specialists are always available to assist you with all of your parts needs.

You can obtain General Electric Regional Parts service through your locomotive builder or by directly contacting the G-E Parts Center located nearest to you.

Locomotive & Car Equipment Dept., General Electric Co., Erie, Pa. 128-30

Parts and Unit Exchange stocks are rigidly maintained in quantity to assure that your orders can be filled quickly. Experienced personnel, who are familiar with all phases of G-E locomotive and equipment parts supply, handle your individual parts orders.

Progress Is Our Most Important Product

GENERAL ELECTRIC

GENERAL ELECTRIC RAILROAD REGIONAL PARTS CENTERS

CHICAGO CENTER
4956 South Major Avenue
Chicago 38, Illinois

ERIE CENTER
2901 East Lake Road
Erie 1, Pennsylvania

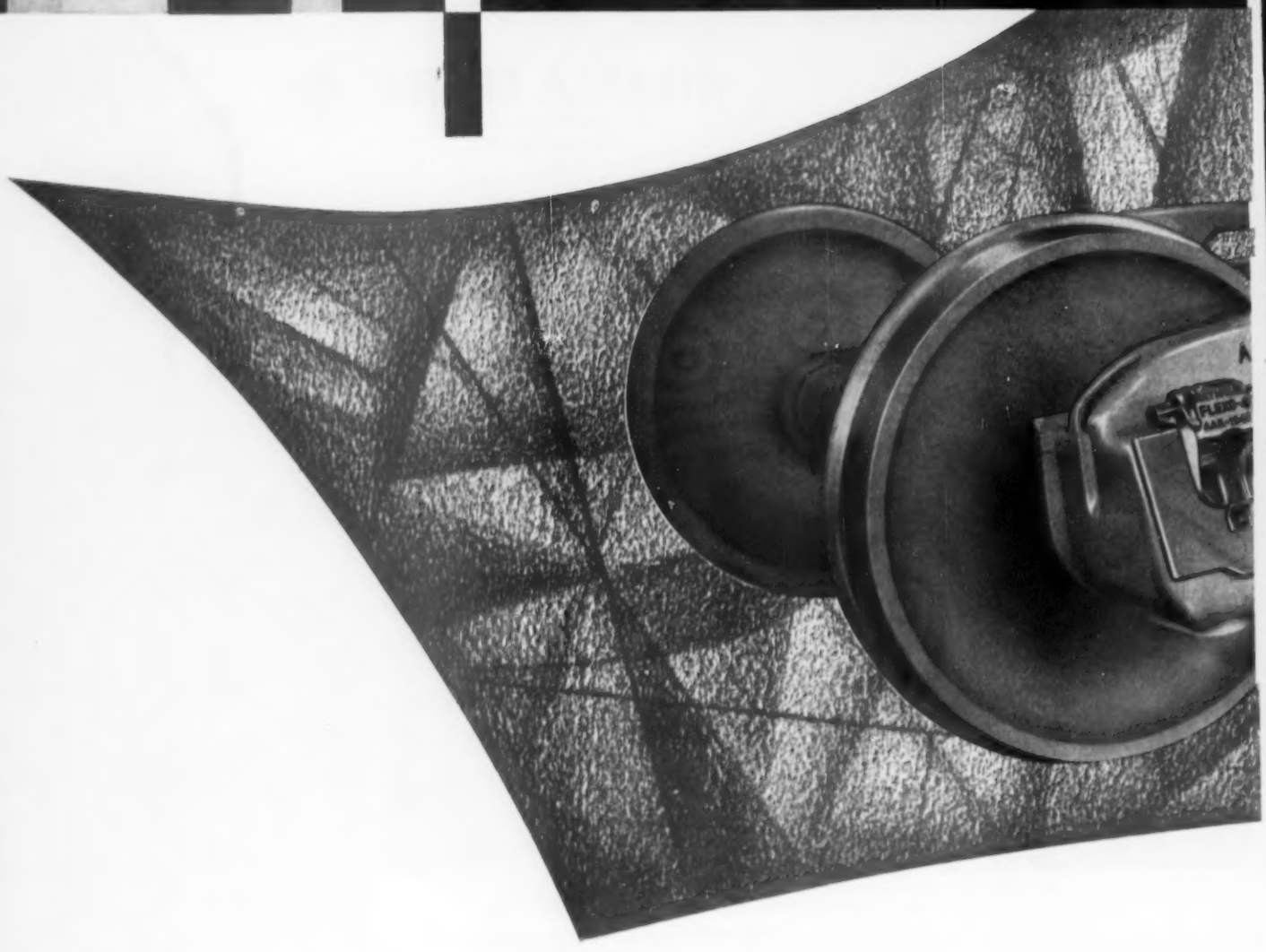
ST. LOUIS CENTER
4050 Bingham Avenue
St. Louis 16, Missouri

ATLANTA CENTER
488 Glenn Street
Atlanta 3, Georgia

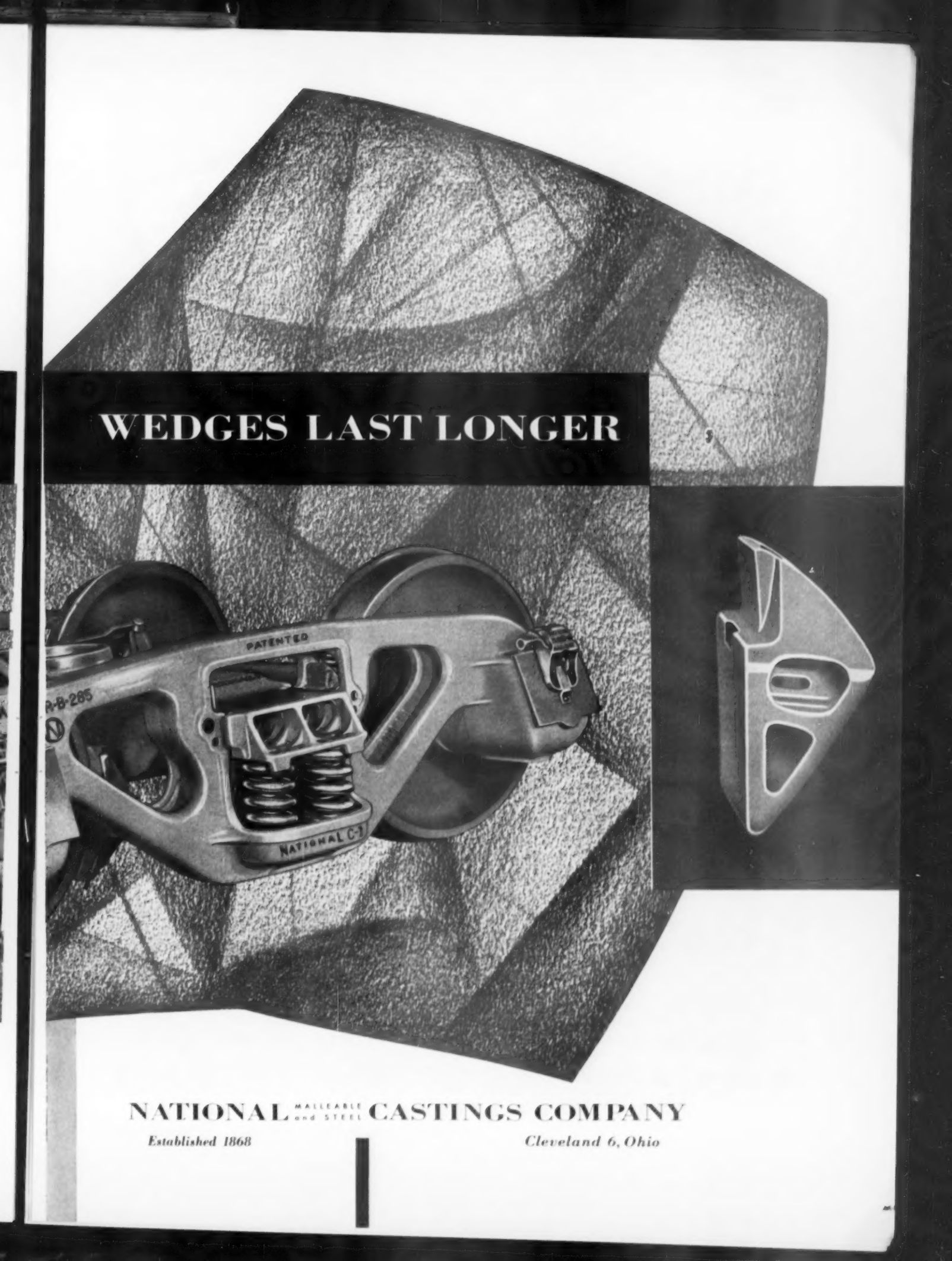
G.E.'s five Parts Centers can quickly fill parts orders from locomotive builders using G-E equipment or from railroads with General Electric rolling stock.

There's Improved Railroading with National Specialties

Reason: C-1 TRUCK



COUPLERS • YOKES • DRAFT GEARS • FREIGHT TRUCKS • SNUBBER PACKAGES • JOURNAL BOXES



NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

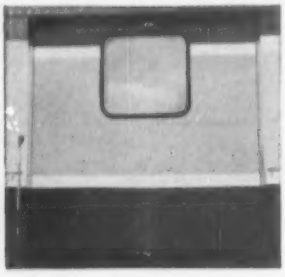
Established 1868 *Cleveland 6, Ohio*

MET-L-WOOD DOORS

METAL BONDED TO PLYWOOD

★ LIGHT... TOUGH... DURABLE
★ NO THROUGH-BOLTS
NO WARPING
★ NO TWISTING
NO SWELLING

BAGGAGE AND POSTAL CAR DOORS

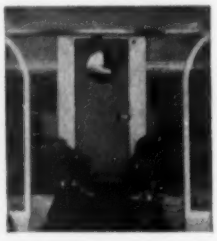


Completely weatherproof Met-L-Wood doors effectively prevent internal rust and rot... and their tough, smooth surfaces stay new-looking for years. Stainless steel channels along bottom edges of sliding doors are rustproof... virtually wearproof. All-rubber window sash installed or removed in minutes... rattleproof... water- and weatherproof. Available in full width and split types ... sizes to meet all needs.

Exclusive Split Door Seal

Drawing above shows simple Met-L-Wood Split Door Seal which assures weather- and watertightness for years of continual use. Seal also provides effective cushion when closing split doors.

PASSENGER CAR END, VESTIBULE, INTERIOR DOORS



Sound-deadening, insulating, vibration-damping Met-L-Wood doors for passenger cars add to service life, cut deadweight ... Combine modern, clean-line beauty with great strength and durability. Furnished for manual or automatic operation, with or without hardware assembly. Tapping plates for hardware are built into doors ... invisible additions to strength and trouble-free service life. Sizes and types to fit all requirements ... exact dimensions insure quick assembly and perfect fit. Door thicknesses from ½" up, as required.

CABOOSE DOORS

Met-L-Wood caboose doors are built to last the life of the caboose—and to give trouble-free service the whole time. Weather-proof, warp-proof, rot-proof doors can be provided with or without stationary windows in all-rubber sash or with standard drop sash. Available with or without hardware. In all sizes to exactly meet specifications.

DIESEL LOCOMOTIVE DOORS

Widely used by builders on new locomotives, Met-L-Wood doors guarantee trouble-free operation of end and interior doors on diesel road locomotives and cab doors for diesel switchers. Furnished to exact dimensions, with or without windows; either with hardware installed, or with tapping plates placed for hardware assembly on the job.

Write for this Bulletin

Met-L-Wood Bulletin 520 gives the complete, illustrated story on Met-L-Wood doors for railroad uses ... shows construction details, describes standard and special types and sizes. Your copy sent free upon request—write for it today.

MET-L-WOOD®
CORPORATION

6755 W. 65th Street
Chicago 38, Illinois

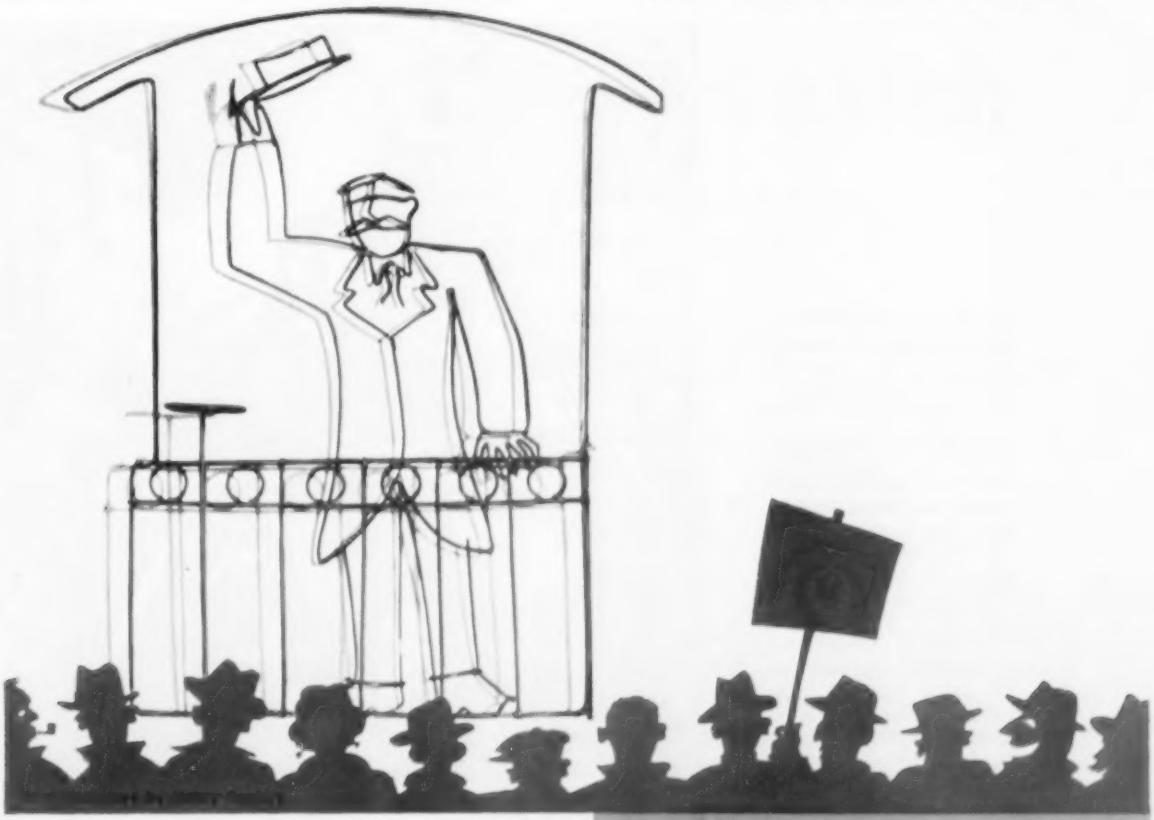
MET-L-WOOD • *STRONG... LIGHT... Smooth Finish... Sound Deadening... Fire-Resisting... Insulating*

Speaking of Platforms:

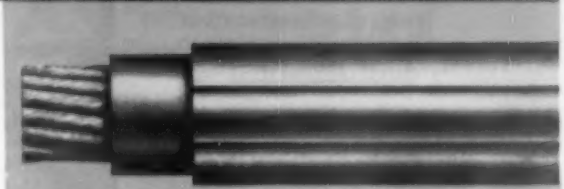
Without employing even a single oratorical flourish, we point with pride to Simplex's manufacturing "platform". Through the years our policy has been to lead the way in wire and cable research and development, and to manufacture products that are second to none in quality, dependability and over-all efficiency.

A look at the record reveals the measure of our success. Year after year, Simplex gets a landslide vote from its "constituents"—the men who are responsible for the safe, efficient operation of the nation's railroads.

SIMPLEX WIRE & CABLE CO., Railroad Dept., 79 Sidney Street, Cambridge 39, Mass.



Simplex

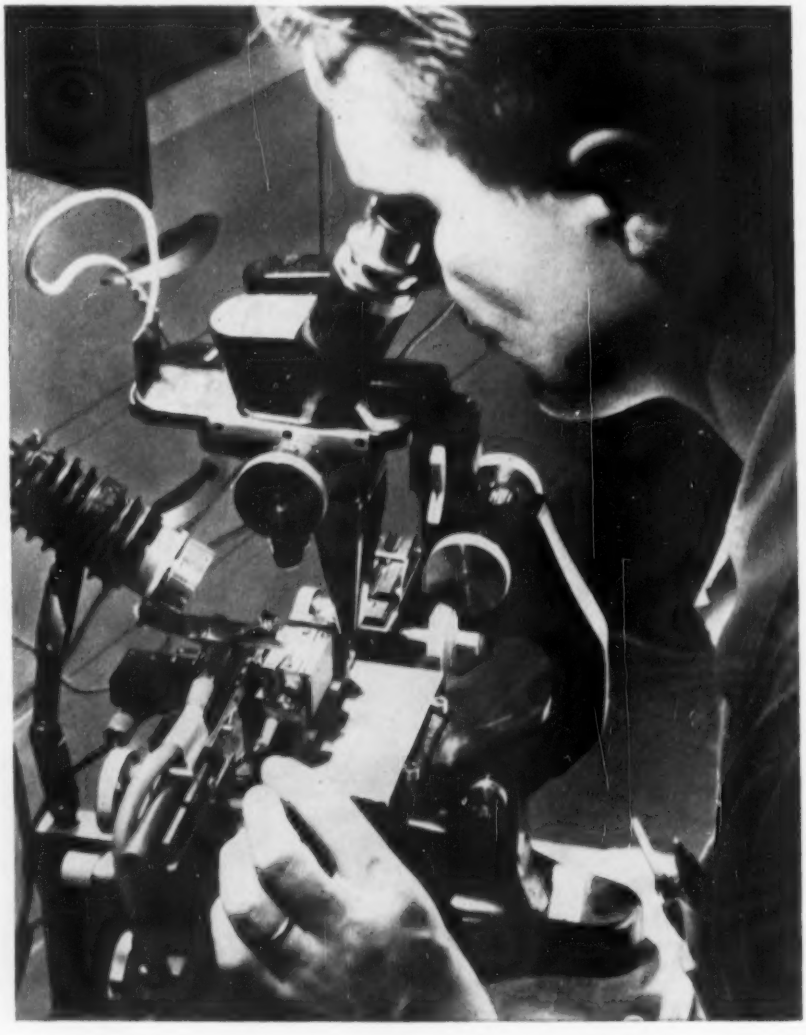


Simplex Diesel Locomotive Cable

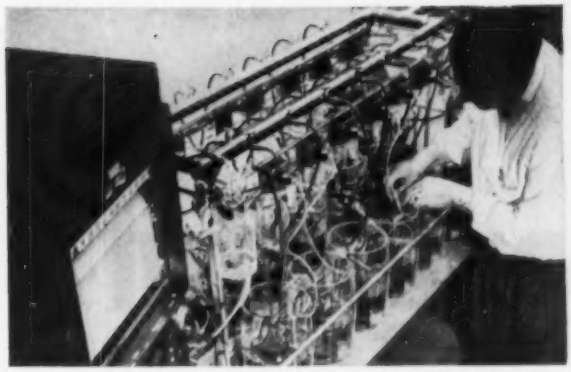
Working at the outer boundaries of knowledge

New Research Laboratories in Parma, Ohio. To expand its pioneering work in solid state and chemical physics, National Carbon Company has enlarged its staff of scientists and provided them with an ideal laboratory setup for creative work. Typical of their modern equipment is an *arc radiation furnace* used for work on high-temperature experiments. It brings light from a carbon arc into focus on a tiny pin-point area, achieving an intensity of several hundred million foot-candles — *approaching the intensity of light near the surface of the sun.*

New



Mechanized tweezers handle graphite crystal. To make it into a proper experimental guinea pig, the fragile crystal must be painstakingly cut and mounted so that electrical flow can be measured along the unique crystalline directions in graphite. Experiments with pure crystals are important because all materials which we know as carbon and graphite are basically composed of the same graphite crystals being prepared here. Tremendous differences in electrical behavior and other vital properties can be traced to variations in size and arrangement of the graphite crystals in carbon products.



Seeking battery of the future. The "fuel cell", a battery producing electricity from such gases as hydrogen and oxygen, is one of many devices being developed at the Parma laboratories—part of a far-ranging research program aimed at improving batteries and carbon elements used in batteries.

The sky's the limit for brush tests. This experimental chamber simulates atmospheric conditions from sea level up to stratospheric heights of ten miles or more, with controlled variations of temperatures and humidity, for development of carbon brushes to meet specific operating needs.

break-through in carbon physics research

promises future advances in carbon brushes, signal cells and other railroad needs

One more barrier is down. And science strides forward in the age-old quest for deeper knowledge of carbon, one of nature's more complex puzzles.

This barrier—the inability to get large graphite crystals pure enough for experimental needs – has now been overcome by researchers of National Carbon Company. Their new annealing techniques, which remove impurities from large graphite crystals, also eliminate imperfections and weaknesses in the crystalline structure.

Several research teams at the new Parma laboratories are exploiting this break-through of science. The new purified crystals are now being subjected to a variety of experimental tortures—electrical, magnetic and thermal.

Fundamental facts about the behavior of the single graphite crystal are being gathered and pieced together like jigsaw cutouts – building up a more complete and systematic picture. In this way, our scientists will be better able to *predict* the properties of new carbon and graphite materials.

The work on single graphite crystals is only one phase of a broad research program in carbon physics. Railroads, as large users of carbon and graphite products, will share in the gains from this work of science at the outer boundaries of knowledge. Write for new booklet titled "Research," telling more about the work at the new Parma laboratories.

Look to **NATIONAL CARBON**
for leadership in carbon and graphite products

NATIONAL CARBON COMPANY · **A Division of Union Carbide and Carbon Corporation** UCC **30 East 42nd Street, New York 17, N. Y.**
Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. *In Canada:* Union Carbide Canada Limited, Toronto

What a wonderful to run a RAILROAD!

Hats off to the Pennsylvania — moving strongly ahead on well-laid plans to enhance its name as a *pace setter!*

The public associates this crack railroad with fast, safe, smooth travel and shipping . . . and the Pennsylvania takes every necessary step to operate its fine equipment *on rigid schedules.*

Gulf is proud to be a major supplier of petroleum products to this great railroad. Uniform-Quality Gulf Diesel Fuels, burning evenly and cleanly, provide the *power-performance* that the Pennsylvania's customers have learned to expect. Gulf Quality Lubricating Oils and Greases protect multi-million dollar investments in equipment . . . help to keep maintenance costs low . . . and help to keep Pennsylvania trains out on the rails serving America.

The men responsible for the Pennsyl-

THE FINEST PETROLEUM PRODUCTS

way

vania's operation and maintenance know that Gulf Sales Engineers are always available for consultation . . . just as they're available to other railroads. If *you* can use their assistance, in maintaining high standards of lubrication and motive power throughout *your* system, just contact your nearest Gulf office.

GULF

GULF OIL CORPORATION
GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pa.

FOR ALL YOUR NEEDS

EXIDE-IRONCLAD BATTERIES

For railway diesel starting

Deliver the power over a wide range of temperatures

BATTERY FOR RAILWAY DIESEL STARTING. Exide-Ironclad Model MVD. Write for Bulletin No. 5348.

At few places on earth do storage batteries ever encounter such extremes of cold and heat as are used to test Exide-Ironclad Batteries in the laboratory.

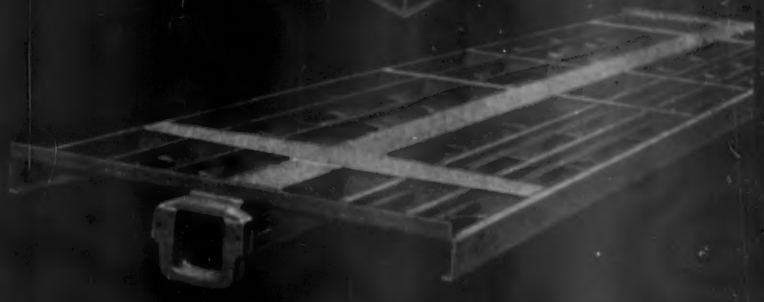
These tests prove that Exide-Ironclad Batteries can be depended upon over a wider range of temperatures than they are ever likely to be asked to endure. And they provide tangible extra assurance of dependability at all the more normal operating temperatures.

Extreme temperature performance is especially important when a battery must have continuous dependability. It is often at these extremes that a battery is most needed. And a battery cannot be called dependable unless it can be counted on every day—all of the time.

The high and low temperature performance of Exide-Ironclad Batteries is a direct result of their unique construction features and special engineering. In countless applications, these batteries have earned an unmatched reputation for long life and high capacity. When you need batteries for heavy duty uses, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

this is the backbone of the very finest freight car in the world



We don't know what "brand" of freight car this is—nor do we care—because WE ARE NOT CAR BUILDERS

. . . but we do know that a man who knows enough about underframes to specify this one could not build anything less than the very finest freight car in the world!

INTERNATIONAL STEEL COMPANY
RAILROAD DIVISION • EVANSVILLE 7, INDIANA

Precision fabricators of correctively designed components:
UNDERFRAMES . . . SIDE ASSEMBLIES . . . DOORS . . . BULKHEADS . . . FLOORS . . . HOPPERS

YOU TOO CAN SAVE MONEY WITH . . .

Lewis sealtite RAILROAD FASTENERS

"ZINC BOLTS CUT COSTS"
We are hearing it more and more, "Zinc bolts save money." More railroads are using Sealtite Double-Life, Hot-Dipped, Sealed in Zinc, galvanized bolts. They add years of life, cut costs by retarding rust and corrosion. Ask about them.
SEALTITE TIMBER BOLT

More than 85 per cent of the nation's No. 1 railroads use Lewis Sealtite products—because the extra features save them money.

•

Each Sealtite bolt and nut is precision designed to do its particular job better. Every Sealtite product is hot forged from uniform special quality steel.

•

All Sealtite products are made in the USA to meet or exceed ASTM specifications.

A FEW OF THE MANY RAILROADS USING SEALTITE PRODUCTS

ILLINOIS CENTRAL

NORTHERN PACIFIC RAILWAY

THE MILWAUKEE ROAD

Santa Fe

CENTRAL OF GEORGIA

GREAT NORTHERN RAILWAY

NEW YORK CENTRAL SYSTEM

OTHER FEATURES THAT SAVE YOU MONEY

FLUSH WITH SURFACE
Sealtite pulls up to a "level with surface" fit without counter sinking.

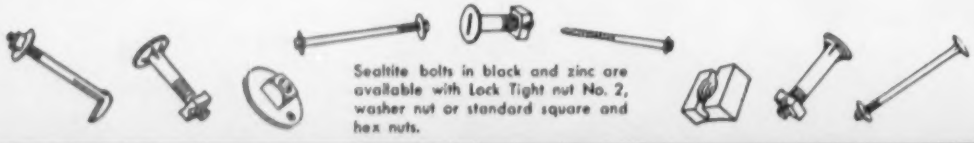
PERFECT FIT
Shank diameter thread to head is exact. No air pockets, no corrosion.

NO SPLINTERS
Sealtite scientific design compresses without raising surface splinters.

PATENTED FINS
For full bearing strength without tearing or splitting wood.

MOISTURE TIGHT
Sealtite tapered, beveled edge forms perfect water tight seal.

ACCURATE THREADING
A spinning fit on each bolt offers easy, fast installation.



Sealtite bolts in black and zinc are available with Lock Tight nut No. 2, washer nut or standard square and hex nuts.

Lewis BOLT & NUT COMPANY
504 Malcolm Avenue S. E. • Minneapolis 14, Minnesota

U QUALITY

LFM

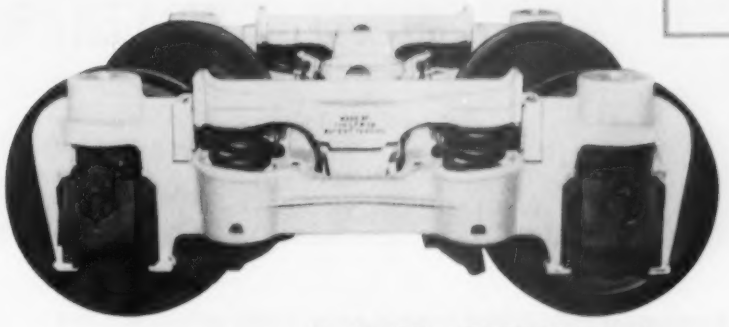
Backed By 84 Years of Railroad Manufacturing Experience...

TRUCK FRAMES

...To Meet Requirements Of High-Speed Passenger Cars, Diesel Locomotives & Switchers

The vast L. F. M. facilities have long been recognized as a major source of production for heavy railroad equipment. In truck frames alone, L. F. M. has produced over 24,000 units for all types of service for every major railroad.

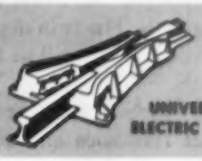
L.F.M.'s engineering and production departments offer both experience and modern production techniques in the design of special or standard truck frames for all types of service. Consult our engineers on your requirements.



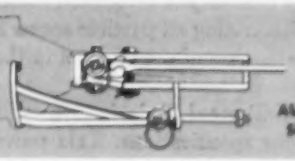
One piece truck frame for high speed freight cars and cabooses.

L. F. M. DIVISION
ROCKWELL MANUFACTURING CO.
ATCHISON, KANSAS

LFM



UNIVERSAL ALLOY ELECTRIC STEEL FROGS



AUTOMATIC BRAKE SLACK ADJUSTER

SURER, SAFER, SIMPLER CONTROL

give

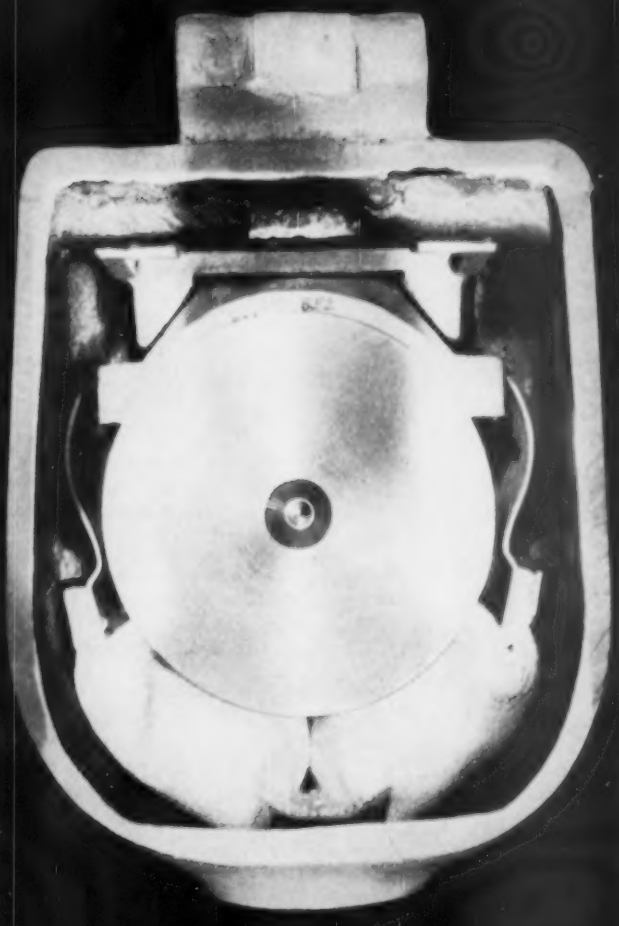
Positive Shift Prevention! Built-in fiber retainers prevent both endwise shift and shift from journal rotation. Pad resilience holds retainers against side of box, away from journal. One universal style for use in boxes with or without retaining ribs.

Far Better Wicking Action! New heavier cotton weave provides superior wicking action and minimizes any tendency of oil-soaked material to adhere to the journal. Cover is woven as a single tube, eliminating all possible seams from the wicking path. The twin design also provides for equalization of the oil level in the journal box through a channel at the center.

Improved Resilience! Twin inserts are made of specially molded foam neoprene, compounded to our specifications. This provides excellent set resistance and oil absorption properties, and is designed for improved resilience.

Superior Oil Distribution! New twin design assures improved oil distribution along the entire length of the journal.

OF THE HOT BOX PROBLEM!



For boxes with or without retaining ribs, fiber plates integral with the new Redipak twin pads engage the stop columns, preventing both endwise and rotational shifting.

COMPARE THESE FEATURES OF REDIPAK TWIN PADS

Permanent size marking
Built-in universal retainers
Grommet at each end for easy removal
One piece cotton wicking cover on special foam neoprene cores

Here it is . . . the new, improved Redipak twin lubricating pad! This latest triumph of National Bearing research retains the simplicity, economy, and durability of the original model—yet achieves new standards of dependable, all-year-round lubrication!

This new Redipak twin lubricating pad is even easier to install, too. Sturdy fiber retainers keep it securely in position . . . whether or not the box is equipped with retaining ribs.

Try out this new Redipak twin lubricating pad and see for yourself how it improves lubrication!

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

St. Louis 10, Missouri

A-5360

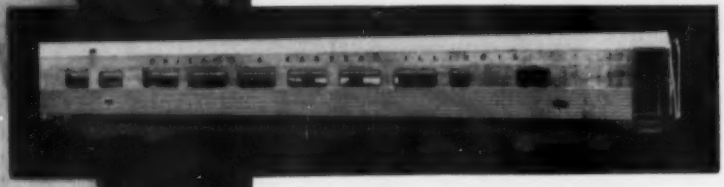
THE NEW LOOK

costs less...

HELIARC spot-welding and fusion welding are helping railroads save up to 88% of new rolling stock cost, by simplifying and speeding many car fabricating jobs . . . Now, using HELIARC welding, railroads can do more car work in their own shops, and realize substantial savings. Here are some important [illegible] welding features.

With HELIARC spot-welding, welds can be made with access to the work from only one side. All welds are clean and sound, and take only seconds to complete. No special skill is required.

HELIARC fusion welding can attain speeds of 100-in. per minute in many operations. This process makes top-quality welds in all types of joints, and in all commercially fabricated metals. It is the most efficient fabricating method for a wide variety of jobs.



Learn how HELIARC welding can speed production and help you save time and money . . . Contact your local LINDE Representative today.

◀ *A new stainless steel window frame is HELIARC welded in place... Ten additional passenger cars were remodeled at only 12% of new car cost.*

RAILROAD DEPARTMENT

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

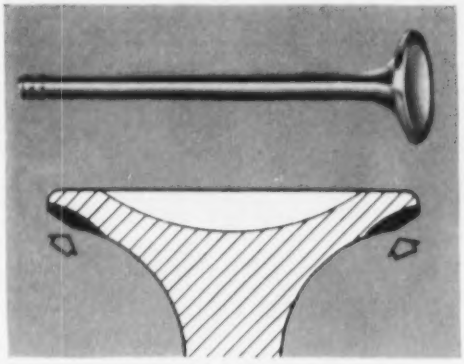
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

"Linde", "Heliarc", and "Oxweld" are registered trade-marks of Union Carbide.

Supplying to railroads the complete line of welding and cutting materials and modern methods furnished for over forty years under the familiar symbol - - -

Electro-Motive Parts Progress

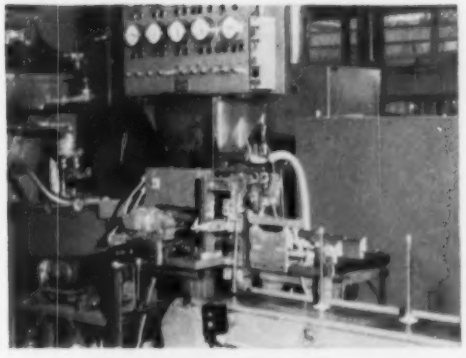
THIS EXHAUST VALVE AVERAGES TWO YEARS SERVICE BEFORE REGRIND



Reasons:

1 *Engine's choice*

Experience has taught us that an engine dictates its own valve needs. Our Model 567 Diesel proved this when previous valve designs of other engines were tried. Exhaustive testing produced the valve shown here, which in normal passenger or freight service runs two years before seat and face regrind. Cutaway view shows special hard Stellite face on valves dictated by our higher horsepower 567C Diesel.



2 *Exclusive manufacture and inspection process*

Manufactured almost entirely by automatic machines, Electro-Motive valves are held to extremely close tolerances. Guarding this precision is a battery of automatic and visual "in-process" inspection controls that assure constant quality and absolute machining accuracy. An example is this electronic machine which checks 14 tolerances at one time on every valve.

3 *Protective packaging*

This special package is used to protect the finely machined surfaces of the valve during handling. Each valve is fitted snugly and protected against moisture with rust preventative V.P.I. paper. Packing like this keeps the valves in perfect condition, always ready for immediate use, and far easier to handle and store.

Continuing improvement is an unending program at Electro-Motive to bring you products of highest quality at lowest cost. When you buy General Motors Diesel parts you get components that are designed, engineered and built to work together. In addition, you benefit with a full warranty and convenient, fast delivery from nine strategically located Electro-Motive warehouses.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS • *HOME OF THE DIESEL LOCOMOTIVE*

In Canada: General Motors Diesel, Ltd., London, Ontario

Precision Parts by MAGNUS mean LONGER, SAFER MILEAGE for Diesel Locomotives

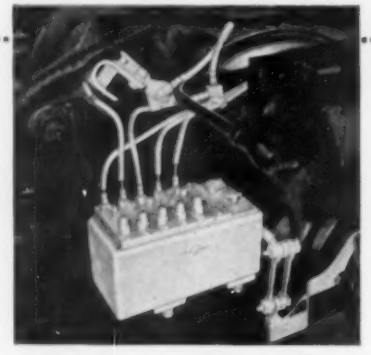
- *Perfectly mated bearing halves*
- *Heat-resistant Satco lining metal*
- *Interchangeable double keeway*
- *Available for all makes and types of diesel-electrics*

High Mileage

traction motor support bearings for LONGER ROAD LIFE

The extra precision that goes into Magnus traction motor support bearings pays off in longer, trouble-free mileage on the road. Quality control of metal mixes, high precision boring and final testing of mated bearing halves *under load* assure an extra margin of dependability — you can't buy a better bearing.

These Magnus HIGH-MILEAGE bearings are available for replacement on all types and makes of diesel-electric and electric locomotives and MU cars. For the complete facts, get your free copy of Bulletin No. 6000.



D-16 FLANGE LUBRICATOR increases mileage between wheel turnings up to 40%

This new, *more positive* method of flange lubrication not only gives greatly extended wheel life, but substantially reduces shop costs, too. Oil pressure to each flange is positively controlled by six individually adjustable pumps that are gang-operated from a common linkage to the truck frame. Unit operates only when locomotive is moving. Can be used to lubricate center pin wear plate also, if desired. Full 16-pint capacity for extra mileage between refills. Write for complete information.

MAGNUS 391 SAFETY VALVE

for dependable overload protection on diesel locomotive steam generators

This high-precision safety valve is specially made for railroad service on diesel locomotive steam generators. Opening and blowdown pressure adjustments are easily accessible and self-locking. Flexible metallic bellows prevent escape of steam into the generator compartment. Write for full details.

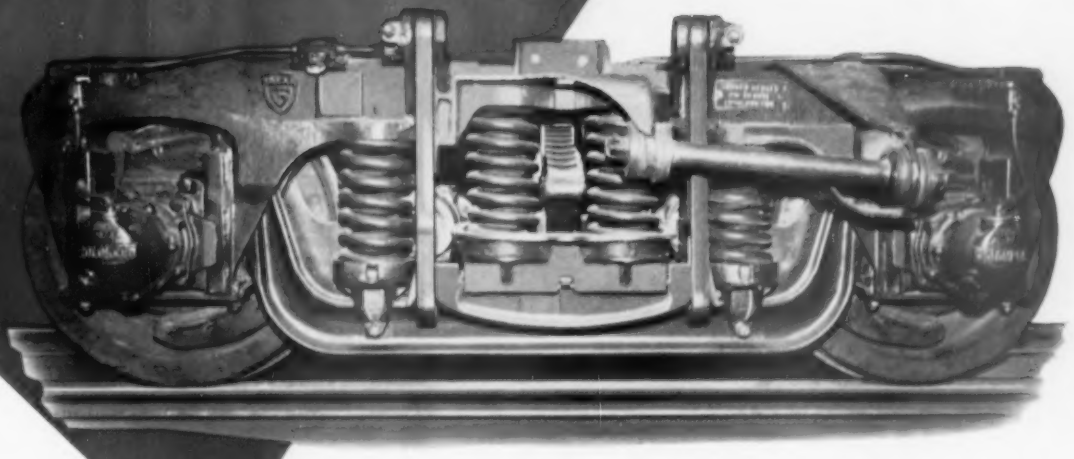
MAGNUS Metal Corporation

subsidiary of
NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.
80 E. Jackson Blvd., Chicago 4, Ill.

Progress in lightweight equipment!

Built by The Budd Company



The New P.R.R. "Keystone" Rides Smoothly, Safely on

COMMONWEALTH 4-WHEEL TRUCKS

The revolutionary Pennsylvania "Keystone" train features Commonwealth *4-wheel* trucks with outside spring suspension and large central bearings on all cars. Designed to meet the requirements of this lightweight equipment, the trucks have a shorter wheelbase and are lighter in weight, but maintain *all* the advantages and proven principles of the modern standard 4-wheel truck.

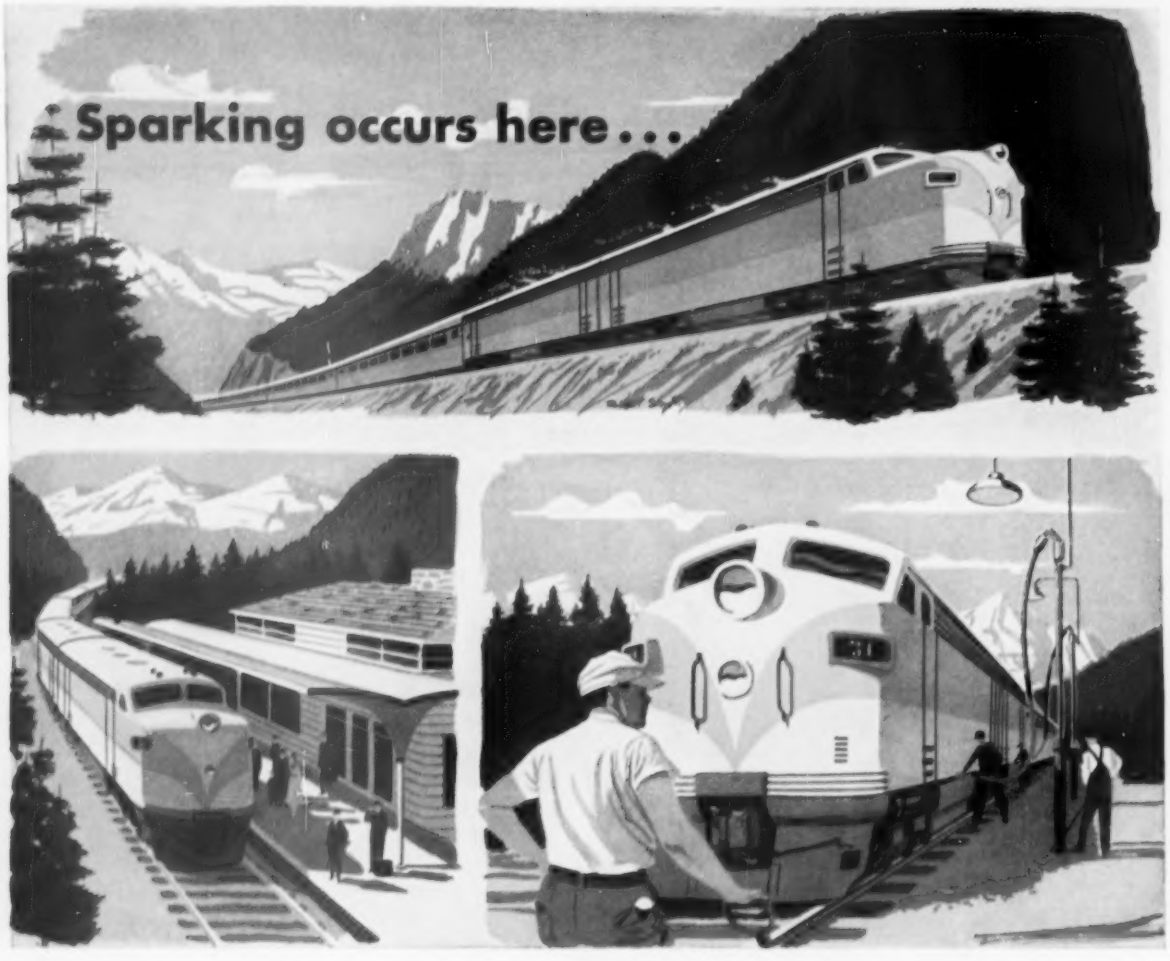
The one-piece cast steel truck frame provides great strength and safety with minimum weight. Outside spring suspension assures better, more comfortable riding at all speeds and provides a wider spring base thereby reducing car body roll. Inspection and maintenance are simplified. Central bearings control truck shimmy and increase mileage between wheel turnings.

Whatever your requirements, in conventional or lightweight equipment, equip your cars with Commonwealth 4-wheel trucks for the utmost in passenger comfort and substantially lower maintenance expense.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. EDDYSTONE, PA.

GEARED TO PROGRESS
RPI MEMBER



though it started here...could have been prevented HERE

If you find that increased sparking hazard accompanies the use of economy fuels, you will be interested in Du Pont's method of preventing it.

How do sparks form?

Carbon deposits build up when engines idle, while standing or coasting. Then when they are put under load, the deposits are ejected . . . and represent a fire hazard.

Tests show that sparking tends to occur when metallic additives are used. This is because they tend to cause larger carbon deposits with greater tendencies to glow.

How to minimize sparking

By specifying fuel treated with an ashless, non-metallic additive, you can greatly reduce this fire hazard. But that's only one of the reasons Du Pont Fuel Oil Additive No. 2 (FOA-2) is recommended for railroad diesel fuels.

Eases filter and injector troubles

FOA-2 also helps you cut the increased maintenance costs sometimes encountered with economy grade fuels. Because FOA-2 is an excellent stabilizer and dispersant, it decreases the rate of insoluble residue formation and so prevents filter-plugging and injector-sticking. Only minute concentrations are required to provide the necessary stability. FOA-2 also has rust-preventive properties.

A Du Pont Petroleum Chemicals Division technical representative will be glad to discuss with you in detail the use of Du Pont FOA-2.

DU PONT

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO. (INC.) • Petroleum Chemicals Division • Wilmington 98, Delaware

How a better precision-fit Guide Pin Bushing* is made in less time with

SHELBY SEAMLESS MECHANICAL TUBING

Here is another manufacturer that is turning out a better product in less time by using Shelby Seamless Steel Tubing.

The product, a wring-fit bushing, makes possible a truly precision die set, which permits closer working tolerances and extends the life of the dies to a degree never before thought possible. The bushing itself is harder, stronger, more uniform, longer lasting and better fitting.

When Shelby Seamless Tubing is used, no boring is necessary—the hole is already there. It offers more, however, than just a pre-bored hole. It combines to an exceptional degree the qualities of strength, uniformity, and dimensional accuracy. These advantages, coupled with the workability and excellent machining properties of Shelby Seamless, make it the ideal material for critical mechanical applications like this.

Available in a wide range of diameters, wall thicknesses, various shapes and steel analyses, Shelby Seamless Mechanical Tubing is produced to exacting standards by the world's largest manufacturer of tubular steel products. Get in touch with our engineers if you would like help in applying Shelby Seamless to your specifications.

*Manufacturer's name on request.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS SHELBY SEAMLESS MECHANICAL TUBING

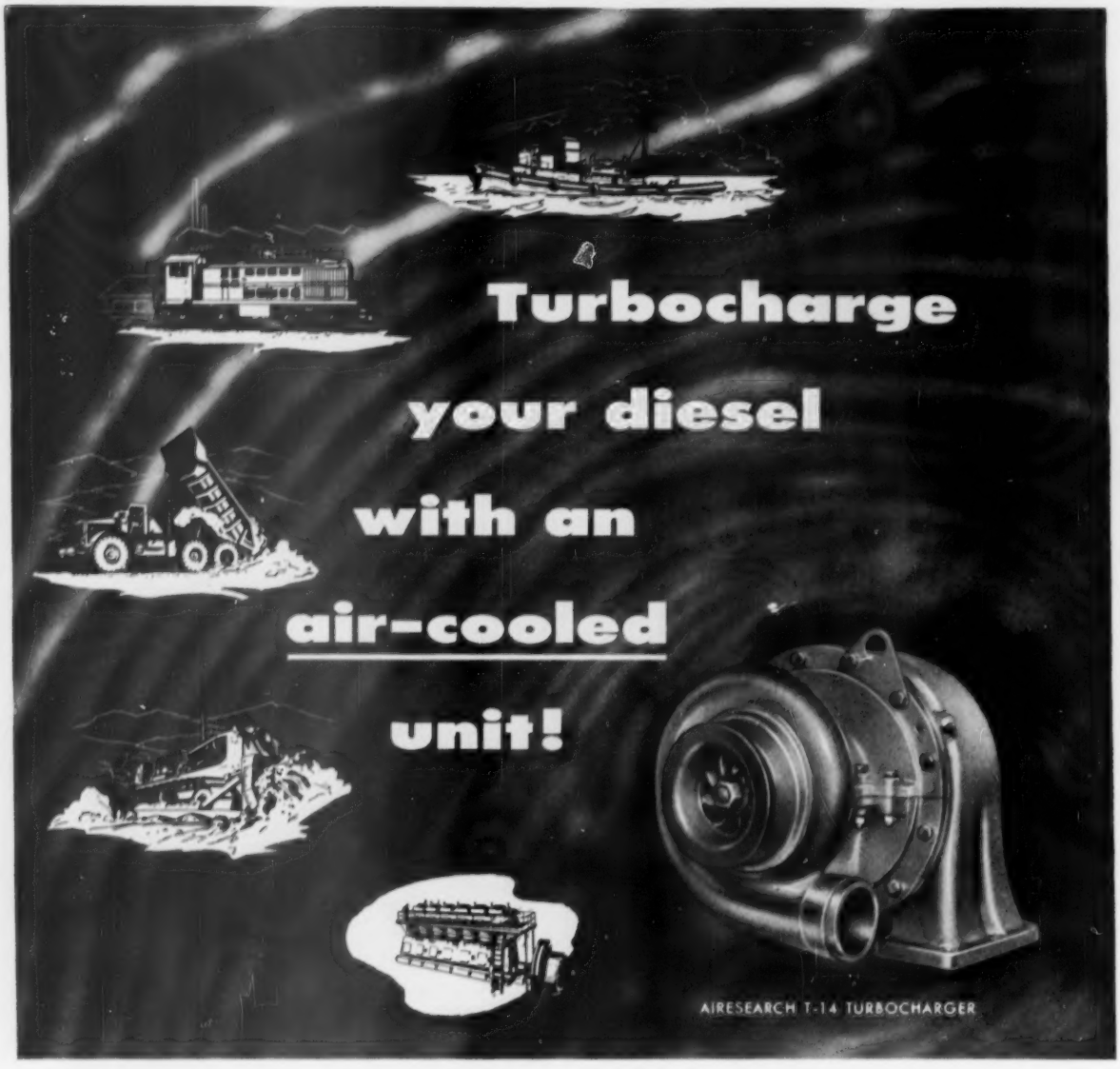
UNITED STATES STEEL

Reputation-Maker for the Wabash...

One of the nation's most famous trains, the Wabash streamliner "Blue Bird", ties Chicago to St. Louis with an enviable record of on-time service. Passengers have come to rely on the comfort and dependability of this fast blue beauty — much as the Wabash has come to rely on Sinclair for lubricating protection. Sinclair is proud to supply the pride of the Wabash with GASCON® Diesel Lubricating Oil... honored, too, that the record shows over 100 U. S. railroads specify this outstanding Diesel lubricating oil.

SINCLAIR RAILROAD LUBRICANTS

Sinclair Refining Company, Railway Sales, 600 Fifth Avenue, New York 20, N. Y. • Chicago • St. Louis • Houston



AiResearch turbochargers increase power to the full capacity of the engine, yet require no extra plumbing and put no added burden on the cooling system.

The diesel industry generally has recognized the fuel-saving, noise and smoke reducing and power-adding advantages of turbocharging. But there are important differences between turbochargers. Some are difficult to service and add complicated plumbing because of the necessity for water-cooling.

All AiResearch turbochargers, from the smallest units for mobile equipment to the large, stationary power plant models, are air-cooled. Each contains a removable rotating assembly which simplifies maintenance, especially in the field. Their modern design resulted from the most extensive experience in the field of small turbomachinery in America.

We invite your inquiry on their application to your diesel equipment.

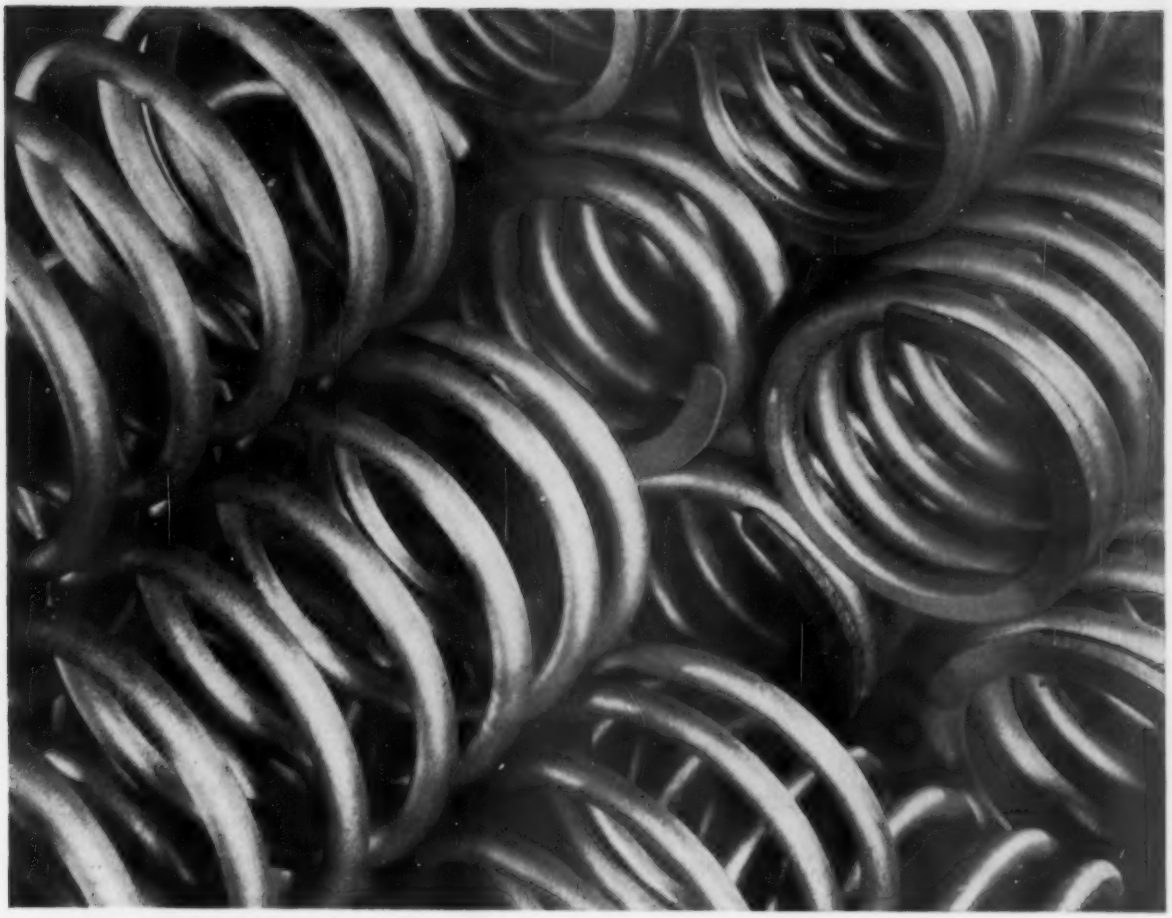
BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS					
MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



Crucible fatigue-resistant springs

mean longer, better performance

Crucible *fatigue resistant* springs bring you a performance-bonus. They are made to last many times longer because they're shot peened.

Whether you specify single or double heat treated Crucible *fatigue resistant* springs, shot peening provides a better surface condition . . . and imposes a negative stress on the surface to offset positive stresses set up in service. It adds up to optimum performance – maximum spring life.

And Crucible, *the nation's leading producer of special purpose steels*, controls the manufacture of springs from ore to finished product. Inspections are continuous, and may include a final Magnaflux, if desired – all designed to bring you a better spring at low cost. For more details, write *Spring Division, Crucible Steel Company of America, McCandless Avenue, Pittsburgh 1, Pa.*

CRUCIBLE spring division

Crucible Steel Company of America

...outlasts ALL other insulating materials!

The installation of Streamlite HAIRINSUL into new refrigerator cars is a one-time investment, because it outlasts the life of the car, and can be used again and again.

The successful use of all-hair HAIRINSUL in refrigerator cars for half a century is the best testimony that service conditions never impair its high insulating efficiency.

Some of the major reasons why Streamlite HAIRINSUL is specified by leading refrigerator car lines are given at the right. Write for complete data.

AMERICAN HAIR & FELT COMPANY
Merchandise Mart • Chicago, Illinois

- **LOW CONDUCTIVITY** — Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity — .25 btu per square foot, per hour, per degree F., per inch thick.
- **LIGHT WEIGHT** — Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.
- **PERMANENT** — Does not disintegrate when wet, resists absorption. Will not shake down, is fire resistant and odorless.
- **EASY TO INSTALL** — Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall section between fasteners.
- **COMPLETE RANGE** — STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings are available.
- **HIGH SALVAGE VALUE** — The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

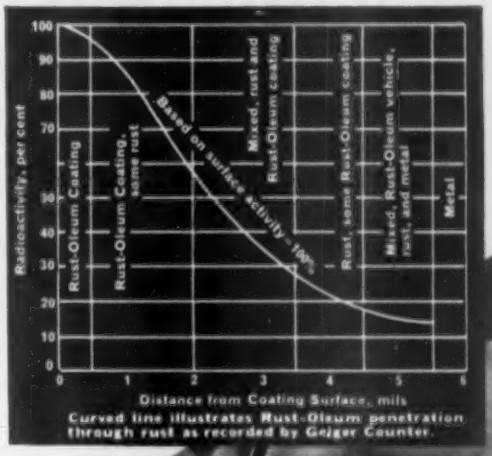
SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

RUST-OLEUM®

PENETRATION

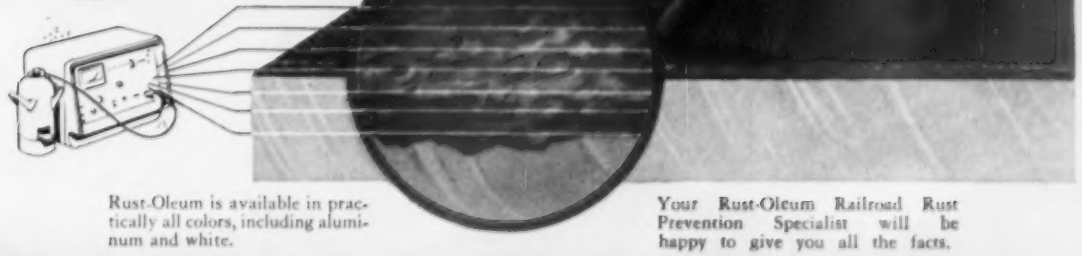
through rust to bare metal traced by Geiger Counter. To effectively stop rust—the vehicle of a protective coating, when applied over a sound, rusted surface—must penetrate through the rust down to bare metal. **Rust-Oleum does exactly that!—as proved by radioactive research!** Rust-Oleum's specially-processed fish oil vehicle was radio-activated and formulated into Rust-Oleum 769 Damp-Proof Red Primer—then applied to rusted test panels. Penetration *through rust* to bare metal by Rust-Oleum's specially-processed fish oil vehicle was then traced by Geiger Counter.

You stop rust, because Rust-Oleum's fish oil vehicle soaks deep down to bare metal and into the tiny pits where it drives out air and moisture that cause rust. You save, because this same *penetration* enables you to apply Rust-Oleum directly over rusted surfaces—usually eliminating costly surface preparations. Attach coupon to your letterhead for your thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," prepared by Battelle Memorial Institute technologists.



Curved line illustrates Rust-Oleum penetration through rust as recorded by Geiger Counter.

There is only one Rust-Oleum. It is distinctive as your own fingerprint. Accept no substitute. Buy—and specify only Rust-Oleum. You'll be happy that you did.



Rust-Oleum is available in practically all colors, including aluminum and white.

Your Rust-Oleum Railroad Rust Prevention Specialist will be happy to give you all the facts.

RUST-OLEUM®

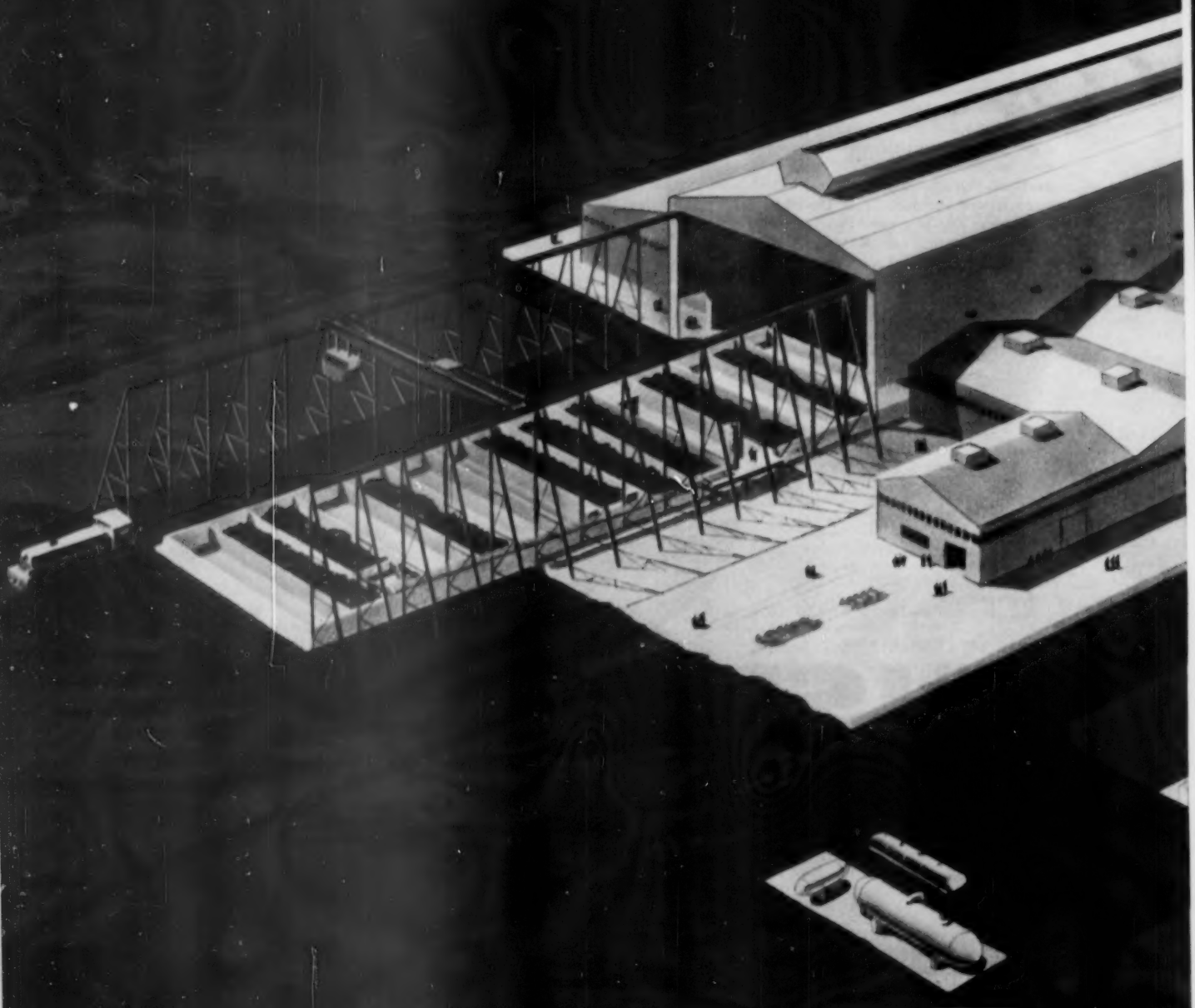
STOPS RUST!

ATTACH TO YOUR LETTERHEAD—MAIL TODAY

Rust-Oleum Corporation
2591 Oakton Street
Evanston, Illinois

- ☐ Complete literature including color charts.
- ☐ Thirty-page report on Rust-Oleum penetration.
- ☐ Nearest source of supply.

The Plant that ACCEPTANCE built!



GRIFFIN WHEEL PLANT · COLTON, CALIFORNIA

Complete plant and office facilities to meet the needs of West Coast railroad shops.

The proof of a new product is in its *acceptance*—and to date the new Griffin EQS steel wheel is rolling under the freight cars of 67 railroads and private car lines in the United States and Canada.

Griffin's answer to this ready acceptance by the railroads of the new EQS wheel is the construction of this newest and most modern steel wheel plant at Colton, California, scheduled for completion early in 1957.

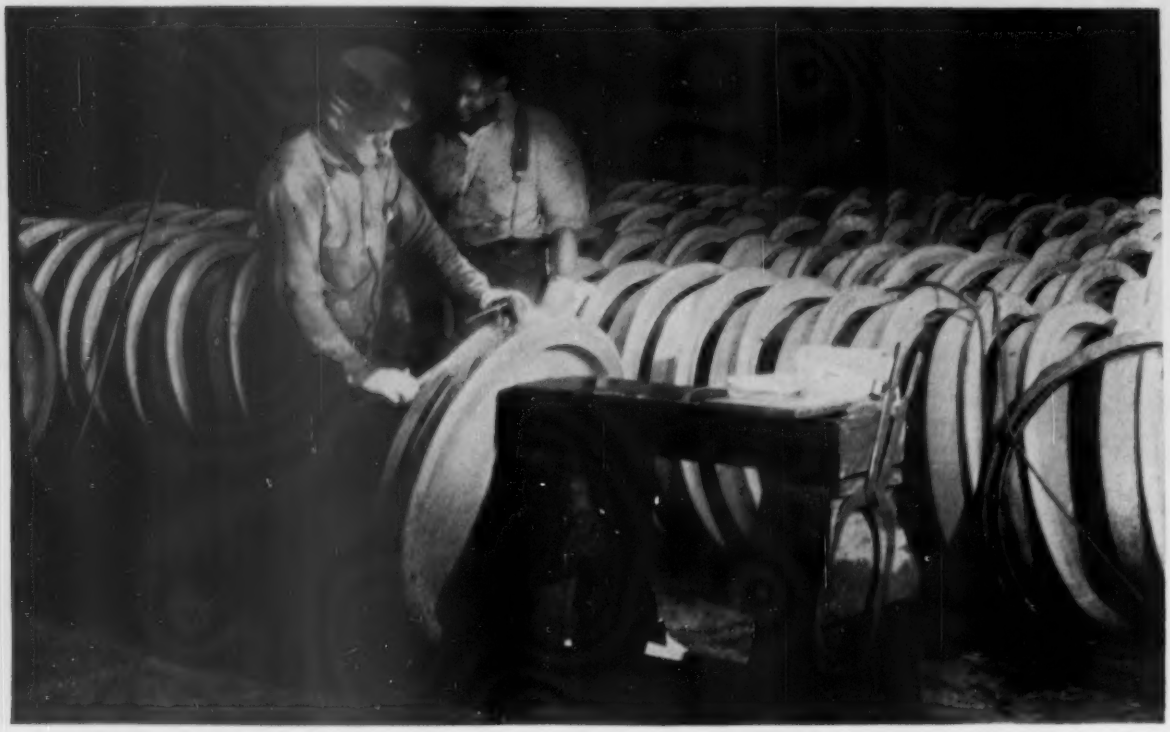
Longer wheel life—better wear—greater uniformity and closer tolerances. Find out how these advantages of the new Griffin EQS give you a higher return on your wheel investment.

GRIFFIN EQS
ELECTRIC QUALITY STEEL

GRIFFIN WHEEL COMPANY
445 N. Sacramento Blvd., Chicago 12, Illinois

In Canada:
GRIFFIN STEEL FOUNDRIES, LTD.
St. Hyacinthe, Quebec

Give the "green" to GRIFFIN and watch your costs go down!



Many Armco Wheels Made in the "30's"

Still Serve Today...

Just Look Under Your Cars

Chances are most of these Armco Wrought Steel Wheels, shown being inspected in 1937, are still on the rails. The majority of Armco One-Wear Wrought Steel Wheels serve longer than 15 years—many for 30 years or more under normal conditions.

Proof of service can be found in the date stamped on the back of the rim of each Armco One-Wear Wheel. Look under your cars for proof.

Forged and rolled for service

Forging and rolling of special steel give Armco One-Wear Wrought Steel Wheels extra toughness and wear resistance. Their long life means economy; their sturdiness means added safety, reliability and faster schedules.

For more information about Armco One-Wear Wrought Steel Wheels, just call the Armco Sales Office near you or write us at the address below.

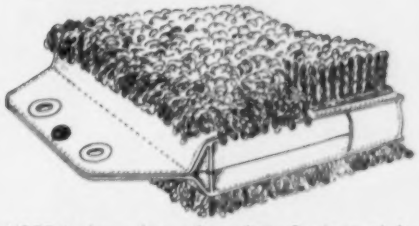
ARMCO STEEL CORPORATION

2156 CURTIS STREET, MIDDLETOWN, OHIO

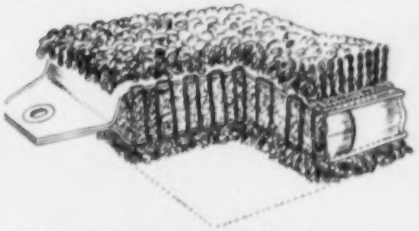
SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

THE LUBRICATOR DESIGNED TO SOLVE SEVEN PROBLEMS

* **AAR Approved for application to 10,000 cars moving in general interchange service.**



NOTE • **heavy** loop pile surfaces • designed for easy application and removal • special unsized duck casing.



NOTE • 100% wool-batt core • quilted construction to assure stability • available in two sizes: 9-10 for 9" and 10" AAR standard journal boxes and 11-12 for 11" and 12" standard boxes.

THE JBS ACME *IS A POSITIVE ADVANCE IN JOURNAL LUBRICATION*

The JBS ACME Journal Lubricator:

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- CANNOT POSSIBLY GLAZE!
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- Our original concept in designing the JBS ACME Journal Lubricator was to combine these *six* basic requirements of a good lubricator into *one* . . . yet provide a *seventh* essential —LOWER COST!

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An Advance Over All Existing Devices For Stabilizing Trucks Lacking Built-in Control . . .

HOLLAND RIDE STABILIZER UNIT, STYLE RS-1

The Ride Stabilizer Unit, Style RS-1, is a significant advance over spring "package" methods of providing Stabilization for Old Style Trucks.

Applying Holland Ride Stabilizer Units, Style RS-1, to such trucks will make them behave by providing a superior degree of stabilization, preventing the bounce, and rock and roll that can cause so much damage to lading, equipment and track.

Now you have a better reason than ever before for making your older cars belong in modern high speed service with Holland Ride Stabilizer Units, Style RS-1.

For complete information, write for Bulletin No. 16-A

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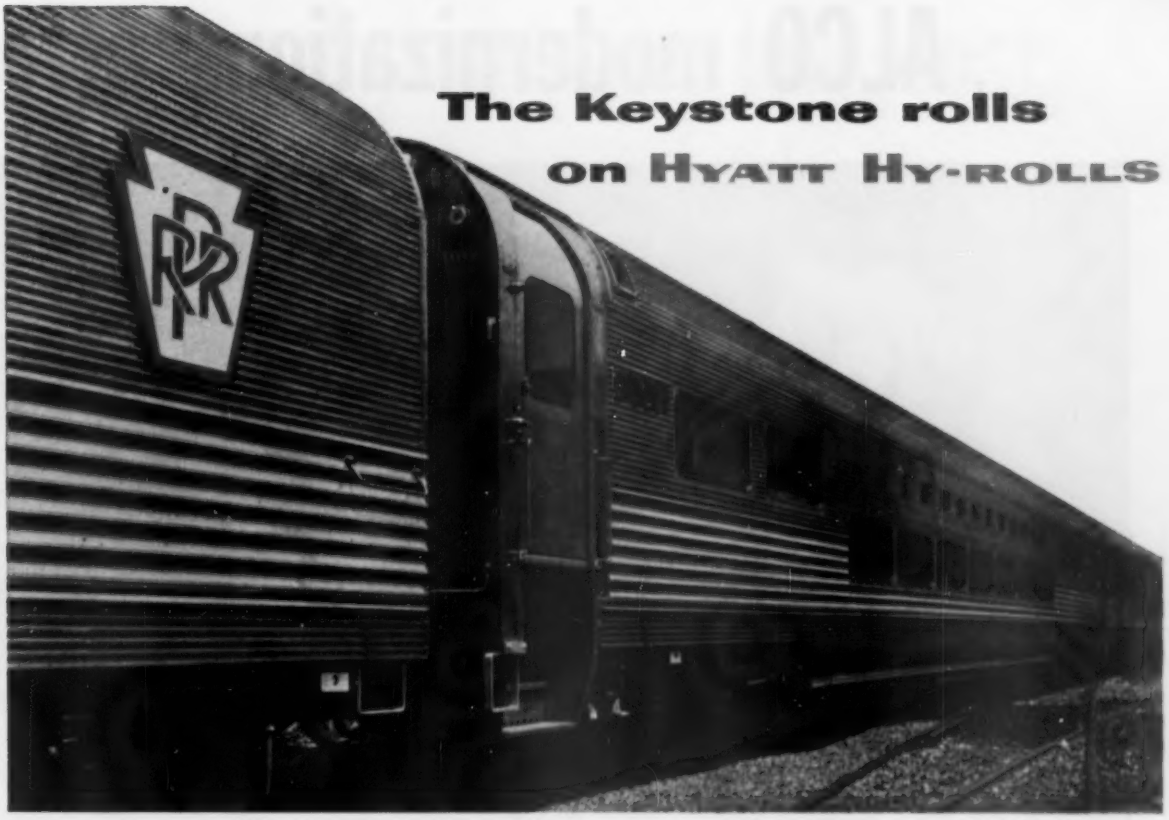


Pennsylvania's Revolutionary Tubular Train Gives Passengers a Smoother, Swifter Ride on Hyatt Roller Bearings with Free Lateral

Another GM contribution to railroad prosperity

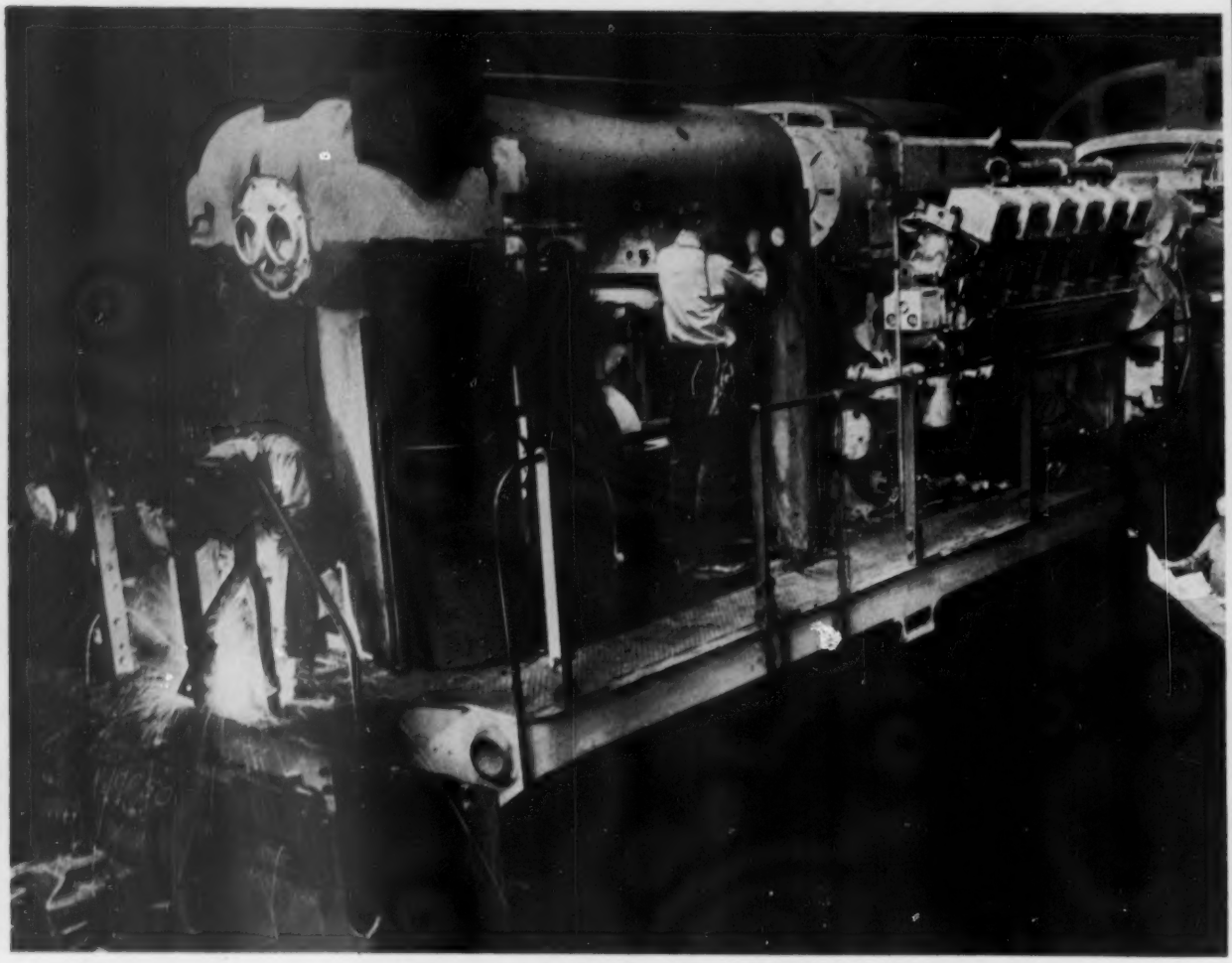
Smooth-running bearings free from lateral jolts and jars are *doubly important* on new high-speed, lightweight equipment. That's one vital reason why HYATT Hy-Rolls are used on the Pennsylvania's Keystone, which recently went into service on the New York-Washington run. Every one of the Keystone's stainless steel tubular cars rolls on passenger-type HYATT Hy-Roll Bearings with the famed *Free Lateral* feature proved superior in millions of miles of passenger travel.

Economy is another mighty good reason for using HYATTS. Their *straight cylindrical roller* design makes them easier and cheaper to install, inspect and maintain. That's equally true of the new simplified HYATT Hy-Roll for freight cars, already adopted by 27 leading lines. For better performance at lower long-run cost, be sure *all* your new rolling stock is equipped with HYATT Hy-Rolls. It pays! Hyatt Bearings Division of General Motors, Harrison, New Jersey.

Watch "WIDE WIDE WORLD" Sundays on NBC-TV

HYATT HY-ROLL BEARINGS FOR MODERN RAILROADS

ALCO modernizations offer



Long-service locomotives are rebuilt in ALCO plant. Railroads may choose complete ALCO Remanufacturing Services. Work includes all engine rebuild and modernization, as well as chassis and electrical improvements. ALCO returns your locomotives upgraded to this year's specifications for service and performance.

ALCO's Modernization Kits and Remanufacturing Services include these important items:

ALCO water-cooled turbocharger—more efficient, responds rapidly to speed and load changes, easy to maintain.

Ni-Resist exhaust manifold—reduces casting growth and failures.

High-pressure fuel injection with snubber valve—more complete fuel combustion, lube-oil condition improved, line erosion reduced.

Ni-Resist insert pistons—top-ring groove wear reduced, increases ring mileage.

Grooveless and partially grooved engine bearings—oil-film thickness and load-carrying capacity increased.

New hardened crankshafts.

Oil-bath filter—maintains high efficiency over 95 per cent, less filter maintenance, reduces engine wear.

Simplified amplidyne control system—fewer parts in system with simpler circuits, maintenance reduced.

Two-piece idler gear with inboard and outboard bearings.

*__Crankshaft__ resurfaced by chrome-plating.

*__Serrated fit__ between cap and block prevents distortion and misalignment, eliminates fretting.

*Items which are normally accomplished by ALCO's Remanufacturing Services.

improved power at low cost

Two Methods Available for Application of Locomotive Improvements: Modernization Kits Are Installed in Railroad Shops; Remanufacturing Services Accomplished at ALCO Plant

Lower maintenance costs with improved performance on long-service ALCO locomotives can be yours when you take advantage of ALCO modernizations. New design developments in ALCO diesel engines, chassis and electrical equipment can be applied to your motive power to give you features which will upgrade your performance standards to this year's level.

Two modernization services are available at ALCO: Modernization Kits and Remanufacturing Services. You may select the method which suits your operation best, or utilize both services. In either service you get completely designed, tested and warranted equipment from the original manufacturer — ALCO.

Modernization kits include complete parts with detailed installation instructions. The kits permit complete installation of an improved, better performing system or assembly within your own shops, often during normal overhaul periods with no extra loss of operating time. At present, many railroads are applying the modernizations as a package—locomotive by locomotive. The modernizations provided by ALCO allow your long-service locomotives to match the performance of those now coming from the production lines.

Remanufacturing Services offer complete engine and locomotive remanufacturing along with many other improvements at fully equipped ALCO plants. With extensive facilities, established manufacturing techniques and many years of locomotive experience, ALCO repair personnel provide the best in locomotive upgrading at moderate cost. For engines, this service is available on either a unit exchange or repair and return basis. In addition, all ALCO remanufacturing is warranted along with the equipment installed.

Let Modernization Kits and Remanufacturing Services benefit your ALCO locomotives, bring more power per dollar. Contact your nearest ALCO Sales Office for complete information, or write P. O. Box 1065, Schenectady 1, New York.

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ALCO PRODUCTS, INC.
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Sales Offices in Principal Cities

Spokane, Portland and Seattle Railway applied ALCO modernizations to its 34 road freight units over an 18-month period. They reported "This modernization program has resulted in more efficient utilization of these 34 road units. This program has updated the diesel engine from a 1946 model to the 1956 model by taking advantage of engineering developments over the past ten years."

Join the Airtac Parade

YOU, TOO, will want to join the *Texaco Airtac* parade when you see the great job it does on all panel-type railroad air filters—the smooth, uniform coverage (no "webbing" or dry spots), the high dust retention resulting in increased cleanliness and reduced engine wear.

Texaco Airtac—a special gel-type oil has remarkable stability, water separation and antifoam characteristics under application temperatures. It does not creep or drip in service even at temperatures as high as 185° F. *Texaco Airtac* is easy to apply, easy to remove, economical.

Let a Texaco Representative help you get maximum collection efficiency from your filters. Just call the nearest Railway Sales Office in New York, Chicago, San Francisco, St. Paul, St. Louis or Atlanta. Or write:

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TEXACO **TEXACO Railroad Lubricants** AND SYSTEMATIC ENGINEERING SERVICE — IN ALL 48 STATES

EDITORIALS . . . . . .

Things Are Looking Up

Less than a year ago it wasn't too difficult to find lots of young men who had a feeling that there wasn't too much opportunity in the railroad business to build a solid and substantial future. We talked to a lot of people in the railroad and railway supply business about the problem of securing and holding promising young men and we wrote to a lot more. Frankly we didn't anticipate the many letters that came to us which discussed the problem in plain language and some of the letters that have been published in our columns just since the first of this year have brought other comments just as much to the point.

What was the point? Well, one point was that many railroads have changed their thinking in the matter of the money they are willing to pay to get the right men. They are more realistic in today's manpower market. The competition is keen and if you want good men you have to pay them. Another point is that some of the thinking with respect to hours of service is rapidly undergoing a change. Even some of the old-school railroaders with the attitude of "I put up with it—you can too" are finding that today's young men are willing to put up with a lot but that "a little more is too much".

Competition is a good thing for any business and the railroad business is rapidly finding out that it has to paint the opportunities for young men in brighter colors in order to attract the kind of people that it has to have to keep going. Right in the ranks today there are hundreds of young railroad men with several years of service behind them who will, if given the opportunity to get a little "higher education" in railroading—even an opportunity to go back to school and absorb some more technical education that the war years may have interfered with—become a substantial back log of the kind of manpower material that the railroads are going to need from which to pick future officers.

It is most encouraging to find that an increasing number of roads are directing less effort toward finding new men in a highly competitive market and more and more effort toward developing some of the experienced young men they may now have in their ranks.

Rectifiers for Locomotives

The Virginian is now taking delivery on 12 new rectifier-type electric locomotives. On the face of things this is an endorsement of trials by the Pennsylvania of this type and of the adoption by the New Haven of 100 rectifier-type electric m-u cars and 10 rectifier-type electric locomotives.

Throughout the world motive power of this kind is finding increasing favor. The most elaborate tests have been made in France. England has announced that most of its future electrification will use it, and more recently a similar announcement has come from the National Railways of Japan. The present application in England is limited to an experimental application of m-u cars, but this is of special note since these cars have been operated with solid-type germanium rectifiers, instead of mercury-arc rectifiers.

Rectifiers operate equally well at any frequency which can be used on the contact system and in all applications abroad, commercial frequencies at 50 or 60 cycles, and 20,000 or 25,000 volts are being used. The use of commercial frequencies considerably reduces the cost of the power supply system and indicates a saving in the cost of fixed property investment up to 30 per cent.

The rectifier locomotives offer a specific advantage to the Virginian since they have flexible speed characteristics which match those of the motor-generator units which were placed in service in 1948, and will permit latitudes of operation not possible with the original locomotives having two fixed operating speeds.

The possibilities of using 60-cycle transformers on rectifier locomotives and converting older equipment to operation on 60 cycles would seem to present some worthwhile advantages for the future operation of railways that are presently paying higher costs for power converted to lower frequency.

NEW BOOKS

FUNDAMENTALS AND DESIGN OF FREIGHT-CAR BRAKE RIGGINGS. By Robert M. Holloway, Pullman-Standard Car Manufacturing Company. The object of this book is (1) to familiarize the beginner with certain fundamental facts concerning freight-car air-brake equipment and rigging; (2) to give the experienced air-brake man a wider understanding of air-brake rules as they pertain to rigging design, and (3) to provide a single source of reference complete enough to design a freight-car brake rigging. Two types of equipment are considered—the single AB type and the multiple-capacity ABEL and ABMC types. Part I is a graphic presentation of the major AAR rules relating to air brakes, with a brief explanation of each of the rules. Part II consolidates air-brake data taken from AAR rules, railroad procedures, car builders' standard practice, and air-brake manufacturers' recommendations. Part III consists of charts and miscellaneous data used by the railroads and car builders for air-brake rigging design.

Air Brake Association, Room 827, 80 E. Jackson boulevard, Chicago 4. Prices: $1.25 single copy; $1 in lots of 10 or more; $.75 in lots of 100 or more.

Why he always takes the train

WE TOOK a little informal survey the other day among people we know who regularly travel by train.

"Why do you take the train?" we asked.

"It always goes," said one, "and on time!"

Another said, "It's safe, convenient—and comfortable."

And another, "I can read, or eat, or sleep, in greater comfort, while I travel by train. It actually *saves me time*."

These replies were typical, and mighty interesting to us, because the comfort, convenience and dependability that rail travel provides are enhanced by uniform and reliable braking. And good brakes are our business.

Our objective is to assist you in maintaining high standards of train operation. Wherever we can be of assistance, our district representatives are subject to your call.

Westinghouse Air Brake
COMPANY
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MORE ECONOMIES AHEAD

with Standard Solid Bearing Assemblies

Why and how elimination of "loose" waste and adoption of "controlled clearance" bearings will still further increase economic advantages of low cost Solid Bearings

YOU SAVE real money now with standard solid bearing assemblies. And soon you'll be saving even more — for two big reasons.

First, there's the program now in force to equip freight cars with "controlled clearance" bearings — standard bearings with finished bore diameters much closer to journal diameters on which they operate. You get a big extra margin of safety during initial run-in periods, and the time for run-in is greatly reduced. Right at the start the bearing load is distributed over a wide area. That's going to greatly increase bearing life.

Second, there's the program now under way to eliminate "loose" waste — either by using approved pad or mechanical lubricators, or by using an approved device to contain the lubricator — such as the R-S Journal Stop that performs the dual function of eliminating excessive axle displacement at the same time that it anchors the lubricator (whether waste or not) firmly in position.

As soon as "loose" waste is eliminated, you'll see a big drop in routine servicing costs and another big jump in bearing performance. Three year periods between detailed bearing inspection are in prospect, too — you'll halve those costs for periodic attention.

There's no question about it. Solid bearings save you money now, and they'll save you more in the future. Then, too, you'll still have all the inherent advantages which solid bearings bring to railroad rolling stock. You can take the maximum load, make the fastest schedule. You save in unsprung dead weight, and you get the smoothest ride on any freight car truck. Best of all, you'll get top bearing performance at the lowest possible cost. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 6, Illinois.

MAGNUS

Solid Bearings

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S.P. Research Pays Off . . .

Large Scale Dual-Fuel Operation Is Successful

Diesel fleet operation with two fuels shows reliable service, increased engine horsepower and no serious maintenance difficulties

Fueling station has been equipped to supply both sections of the two-compartment locomotive tank at the same time.

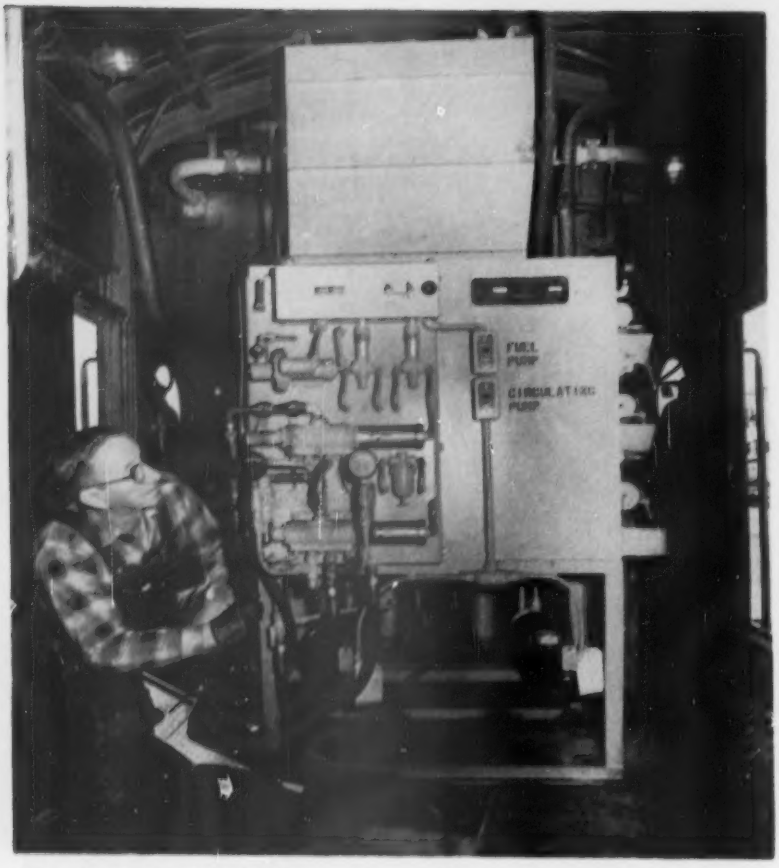
Much has already been accomplished in the Southern Pacific diesel fuel research program but more remains to be done, according to P. V. Garin, SP's engineer of research and mechanical standards, in reporting to the American Society of Testing Engineers' meeting at Los Angeles, Cal. The dual fuel system has proven its reliability and wear rates and deposits are less than anticipated. However, more frequent oil changes are required pending development of a lubricating oil better adapted to this particular operation. The higher heat content of residual blended fuel gives added engine horsepower, which augments savings in fuel cost. Improved engine parts and fuel-burning equipment and practices are the next step in this fuel research program, according to Mr. Garin.

The residual blend fuel, selected for trial use in Electro-Motive Model 567-B diesel engines and designated the X-6 type by the SP, falls within the range of Navy Special Boiler Fuel and should be available in many areas.

Complete typical analysis for this X-6 fuel as used during the test is shown in the table, together with

Typical Analyses of X-3 and X-6 Fuels

Physical Property	X-3 Fuel	X-6 Fuel
Flash, deg F	165	180
Viscosity, SSU at 100 deg F	8.1	300
Gravity, deg API	30.9	17
Sulphur, per cent	0.50	3.3
Pour point, deg F	—5	—35
Carbon residue, per cent	0.15	5.7
Ash, per cent	Nil	0.05
Color	4	Black
Cetane No. (calc.)	41	25
Btu per gallon	141,075	148,385
Btu per pound	19,445	18,700
Storage stability	good	good



Nemec dual-fuel unit is installed at rear of A unit. At left on the front is the selecting panel. At bottom left is the heavy fuel pump, and bottom right circulating fuel pump. Primary and secondary filters fit through the body of unit and are inserted from right.

the typical analysis for the X-3 distillate fuel used as the second fuel with the dual fuel system. It can be noted that in addition to its high viscosity, X-6 fuel is characterized by a high sulphur content of about 3 percent.

On-Off Control Chosen

The system finally developed as the result of Southern Pacific experimentation incorporates the modifications and improvements developed by the research program, is classified as an "on-off" system as compared to the "blending" system in which a constant amount of distillate fuel is fed to the engine through the output range and is supplemented as required by engine demand from the separate residual fuel tank aboard the locomotive. This latter system is currently being tried out on Electro-Motive engines for comparative purposes.

The "on-off" system is the type applied to 50 Electro-Motive diesel freight units operating between Roseville, Calif. and Sparks, Nevada, over the Sierra. The system has been very successful in this operation, in view of the fact that engines are working for a prolonged period at full throttle on blended residual fuel, followed by drifting downgrade on distillate fuel.

Electro-Motive diesel engines, as presently designed, still require a suitable distillate type fuel for idling and low outputs to avoid fouling of the engine, excessive smoking and spark emission. From throttle position No. 5 and higher, Model 567-B engines will operate effectively on residual blended fuel such as the X-6 type. The dual fuel system by using residual type fuel at high outputs only, eliminates the problems encountered with this type of fuel at idling and low outputs and permits utilization of less costly fuel during periods of high fuel consumption. Engine performance, availability, and utilization have not been adversely affected by dual fuel operation.

The maximum viscosity of residual type fuel that can be used is dependent upon the amount of heat available to reduce fuel viscosity prior to injection. Heat exchangers utilizing engine cooling water are satisfactory for X-6 type residual blended fuels with a viscosity of 300 SSU at 100 deg F. In order to utilize fuels of higher viscosity than can be handled by cooling water heat exchange, it will be necessary to provide additional fuel heating facilities aboard the locomotive unit. These facilities should preferably take advantage of waste heat such as that available from the exhaust stack to supplement that available in the cooling water. Exhaust stack heat is at a maximum when engine is working at high output, which coincides with the operation at which a maximum temperature is necessary for heating heavy fuel. Electric fuel heaters and other energy consuming heating systems are chargeable against the output of the diesel engine and are, therefore, less economical.

Combustion pattern with X-6 type fuel when heated to 170 deg F is essentially the same as with distillate fuel at full throttle position. Smoke emission at high output with X-6 type fuel is equivalent to distillate fuel, indicating completeness of combustion. Spark emission with X-6 fuel is at a normal level. High sulphur content of approximately three per cent in X-6 fuel has not produced excessive wear or corrosion within the engine after more than one year's operation with alkaline reserve type of lubricating oil. No doubt this is because the fuel is used only at high output when engine temperatures and pressures are conducive to the complete combustion.

Filtering Not Complicated

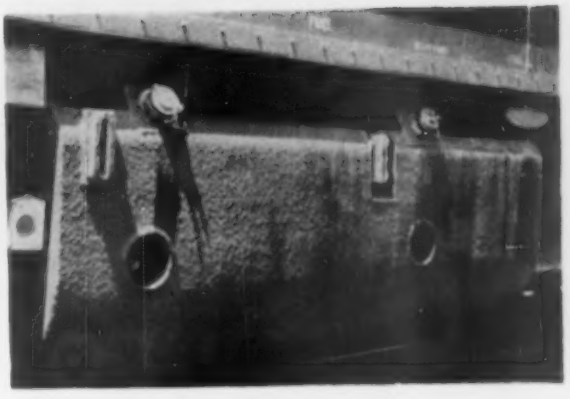
Cetane number, calculated at 25 for X-6 fuel, appears to be of no consequence in the performance of this fuel at high outputs only. Filtration problems with X-6 type fuel have not been experienced. The filter system utilizing a sock-type filter element as a primary filter and a resin-impregnated pleated paper type element as a secondary filter has

Thermal Insulation For Dual Fuel Tanks*

With heavy diesel fuels, a number of interesting problems have evolved. One was development of an insulating coating for the dual fuel storage tanks on the diesel units. Residual oils tend to solidify at lower temperatures, and while most storage tanks are equipped with heat exchangers, they still require insulation to maintain proper temperatures effectively during cold weather runs. A weather-resistant and oil-resistant insulating coating, developed by the Pacific Paint & Varnish Co., can be readily sprayed to a thickness of ¼ to ½ in.

A test was conducted for effectiveness of this coating. Two ¼-gal. cans were completely coated on the outside with the insulating coating to a film thickness of approximately ½ in. Another ¼-gal. can was left bare without any insulating coating. The cans were equipped with agitators running 100 rpm and with thermometers. Cans Nos. 1 and 2 were filled with X-6 heavy diesel fuel which had been heated to 140 deg. F and placed to a depth of ⅞ of their height in a salt-ice bath (20 deg. F). Temperature at start of test was 130 deg F. Can No. 3 was filled with identical fuel and left in a 140-deg. F oven for 16 hr. to allow the contents and coating to reach a uniform temperature and then immersed to the same depth in a colder bath (—5 deg. F) of salt, ice, and dry ice.

*From a paper by G. J. Grieve, Pacific Paint & Varnish Co., presented at the meeting of the ASTM in Los Angeles, Cal.



Comparative Heat Loss in Insulated vs. Uninsulated Test Cans

Time of reading (min.)	Can No. 1 Uninsulated (per cent)	Can No. 2 Insulated (per cent)	Can No. 3 Preheated-Insulated (per cent)
5 min.	48	13	11
10 min.	65	23	18
20 min.	77	37	39
30 min.	97	45	51
45 min.	—	55	65
60 min.	—	67	76
90 min.	—	70	83
120 min.	—	72	86

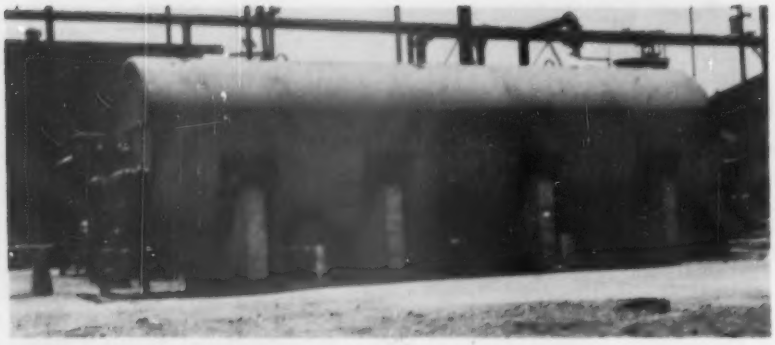
proved an excellent combination for this type of fuel. No difficulty has been experienced in realizing at least the normal one month's service from this combination.

Standard injector with spray tip having six holes 0.0115 in. in diameter at a 75 deg spray angle has produced the best results to date of the various types of spray tips tried out in dual fuel operation. Alternate operation of injectors on distillate and residual fuels has a beneficial effect on minimizing injector tip deposits. It is necessary, however, to avoid contamination of distillate fuel with residual in order to avoid excessive smoking or fouling of injectors, particularly while idling.

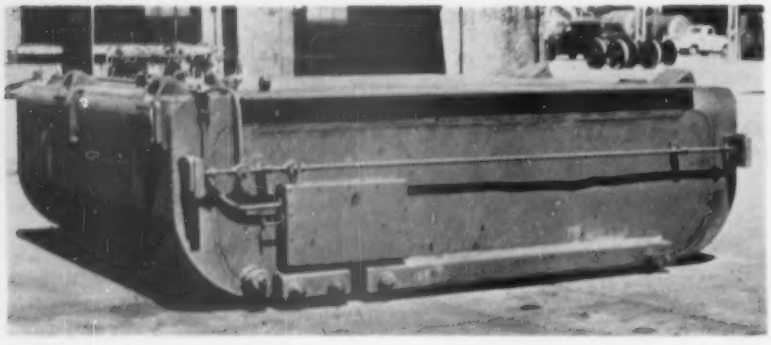
The higher volumetric heat content of the X-6 residual blended fuel, even when heated for injection, increases the horsepower output of the diesel engine at a given power piston setting. A secondary fuel saving can, therefore, be realized by adjusting the power piston setting to compensate for this increased heat content inherent in the lower gravity X-6 fuel. From experience to date, indications are that wear rates on rings and liners with dual fuel operation are somewhat higher than with distillate fuel. However, by proper selection of power assembly components and type of lubricating oil, premature removal of power assemblies for this cause should not be necessitated between scheduled engine maintenance periods. It is felt that this fact is more significant than the magnitude of the wear measurements themselves. Indications are that the accumulated engine parts wear the dual fuel operation is much less than anticipated or predicted. This again is no doubt due to the utilization of the residual type fuel at high engine outputs only. Variation in wear rates depending on the location of an individual cylinder assembly relative to the blower would indicate that airborne abrasives are a definite factor in the general wear pattern, regardless of the type of fuel used.

Chrome-plated cylinder liners hold up well in dual fuel service, but the type and surface finish of the chrome plating appear to affect materially the wear rates of liners and rings. Preliminary indications are that channel chrome plating wears appreciably less than the pocket chrome plating of the types used in the test engines. Further information is being developed on the relationship between type of chrome plating and wear rates in the current research program on power assembly components. This will include the effect of liner surface conditions on ring wear and scratching.

Without compensating for the increased horsepower inherent in the higher volumetric heat content X-6 fuel, cylinder liner wear, per year, at 2-in. from top of liner, based on the same type of chrome-plated liner, was found to be 0.0064 in. for X-6 residual fuel and 0.0040 in. for X-3 distillate fuel, or 1.6 times greater with residual fuel. However, the magnitude of this wear rate is sufficiently low so that the normal service life of the liner will not be affected or maintenance cost increased on this account. On an equivalent horse-



"Day" tank holding 12,000 gallons is equipped steam coils to produce viscosity which will permit the oil to be pumped to the locomotive and handled on it.



Partitioned fuel tanks presented not only problems of thermal insulation but required each section of the tank to be equipped with its own emergency fuel cut-off.

power basis, this increased wear can be expected to decrease. Engine builder's recommended limit of wear for cylinder liners is 0.025 in. in diameter.

Top compression ring face wear with X-6 residual fuel appears to be approximately twice that obtained with X-3 distillate fuel. As mentioned, the surface condition of the chrome-plated liner materially influences rate of ring wear. Wear rate increase on second and third compression rings is less. It is evident that a more wear-resistant compression ring for use in chrome-plated liners is desirable for dual fuel operation on Electro-Motive Model 567 engines. Such a better wearing ring would also benefit 567 engines operating on distillate fuel, particularly those at higher rated output. The additional horsepower from the dual fuel engines, because of the higher volumetric heat content of the X-6 fuel, doubtless influenced the increase in ring wear in the test unit to a certain extent. Top compression ring side wear was also greater with the X-6 fuel as compared with the X-3 fuel. Oil-ring wear with both fuels was, in general, comparable.

Piston thrust washer wear per year with X-6 fuel averaged 0.0065 in. as compared with 0.0039 in. for X-3 fuel, or approximately 1.7 times more wear with the residual fuel. This was, no doubt, influenced by additional horsepower from the dual fuel unit and abrasive conditions from position of unit in consist. The thrust washers used in both units were not the centrifugally cast type currently used.

Connecting-rod bearing and journal wear in X-6 unit appeared comparable to those in X-3 unit, as did piston-pin and bushing wear, based on clearance measurements.

Engine deposits found after 13½ months' operation with X-6 fuel were satisfactory and in no way affected the proper operation of the engine. Compared with the deposits found in X-3 unit after 12 months' operation, using the same lubricating oil, the X-6 unit was rated at 61.9 per cent clean as compared to 69.5 per cent for the X-3 unit, 100 per cent indicating a perfectly clean new engine.

Piston compression ring belt deposits with X-6 fuel was slightly heavier than with X-3, but apparently did not impair proper ring action as there were no stuck rings. Oil control ring deposits were also slightly heavier with X-6 fuel, but oil drain passages and grooves were open. Piston skirt varnish was darker with X-6 fuel, but there was no evidence of scoring. Piston carrier bushing oil groove deposits and wrist-pin deposits were similar with the two fuels.

Air-port deposits were slightly heavier with X-6 fuel. After 13½ months' operation air ports were approximately 80 per cent open (front and back) as compared with 85 per cent open with X-3 fuel after 12 months' operation. Exhaust-port deposits with X-6 fuel were very similar in thickness (approximately ⅛ in.) to X-3 deposits, although they were somewhat darker in color.

Exhaust-valve stem and underhead deposits with X- fuel were comparable to those formed with X-3 fuel, although valve seat and face deposits were somewhat heavier.

Adjustment of horsepower with higher volumetric heat content fuels will minimize the possibility of corrosive attack on valves from contact with hot exhaust gases. Compensation in horsepower output will reduce temperatures and alleviate critical conditions where such attack can occur. Protective coatings on valves, such as aluminizing and chrome plating, are being investigated in research project on diesel power assemblies to determine whether they are beneficial in resisting attack. Grain flow in the valve head is important as exposed grain ends appear more subject to attack. Stellite seats on exhaust valves are desirable with dual-fuel operation, as well as on distillate-fuel engines, to resist guttering or seats due to particles, airborne or otherwise, becoming imbedded therein.

As expected, somewhat higher combustion residue loads were found in the samples of lubricating oils from the X-6 unit as compared with the X-3 unit, both units using the same lubricating oil. The trends in the used lubricating oil follow the normal pattern, but the cycle is

Deposits on four valves assemblies from one cylinder head were not considered unusual, and with proper lubricating oil there are no engine deposit complications from the dual-fuel operation.

accelerated. It appears that at least three-month intervals can be realized on the dual fuel units between drains based on lubricating oil condition and proper condemning limits. This is not considered an abnormally short lubricating oil life considering the type of fuel used and compares with oil drains at approximately six months' interval with distillate fuel in the same service. The rate of viscosity increase in the X-6 unit was somewhat higher than in the X-3 unit. This was undoubtedly due to the greater accumulation of contaminators in the lubricating oil but did not necessitate premature oil drains. Alkaline reserve type of lubricating oil gave good performance in the X-6 unit. Neutralization of the alkaline additives in the X-6 unit was approximately twice as rapid as in the X-3 unit. The acid number range encountered in the lubricating oil from 2.5 to 4.0 at a pH of 11.0 indicative of weak acids and lubricating-oil additive decomposition and is not considered harmful to engine operation. This fact was verified by inspection of lubricated engine parts at end of test period.

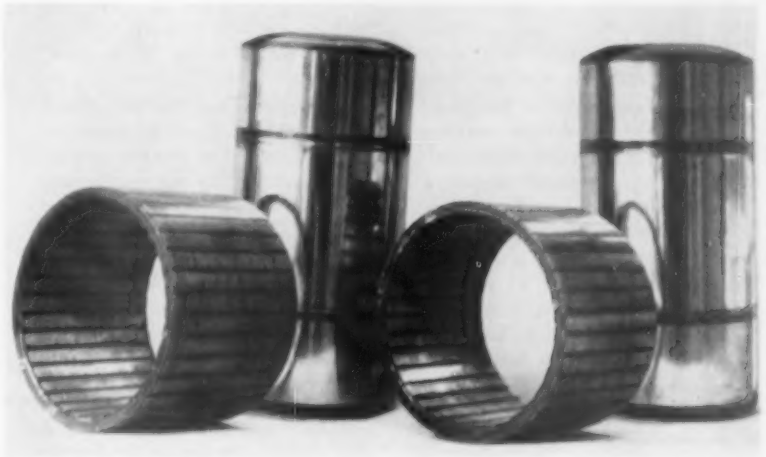
Preliminary experience with non-dispersant lubricating oil in dual fuel service indicated that this approach is worthy of further study. Analyses of this oil during the initial test period showed low acid numbers, stable viscosity and low percentage of contaminators, probably due to the improved filtration possible with this type of lubricating oil which permits removal of contaminants from oil stream by filter action rather than their dispersion and continual circulation in the engine. The inherent mild dispersant characteristics of this test lubricating oil resulted in general engine cleanliness for the duration of the preliminary test.

Lube Oil Is Problem

Another variation in lubricating oil practice being further investigated is the addition, under laboratory control, of additive concentrate to the crankcase to maintain the desired level of oil condition, thereby extending service life of oil in the engine.

Further study should be made on improvements to the lubricating oil filter system on Electro-Motive diesel engines, particularly with dual fuel operation, so that contaminants in the oil stream are more effectively removed. Such improvements would also benefit engines operating on distillate fuel. However, no changes in normal lubricating oil filter practices were necessitated by the dual fuel operation even with the present lubricating-oil filtration system.

The SP's first standing tests began late in 1954 with an EMD F-7 unit. In February 1955, the SP began first road tests with a dual-fuel system. Since August 1955, a total of 209 new units have been ordered with partitioned fuel tanks to simplify future dual-fuel installations. At the present 52 SP road freight units in regular freight service are burning two fuels.



Wrist pins and piston carrier bushings did not show unusual wear after 13 months of dual fuel operation. As was done with all engine test components, duplicate assemblies were applied to an engine burning standard diesel fuel.

BRE-FGE-WFE Plan and Build Because . . .

Mechanical Refrigeration Is Here To Stay

Shops, shop equipment and shopping schedules are being laid out to insure the success and continued progress of one of the fastest growing railroad freight operations.

When the first mechanical reefers came to the BRE-FGE-WFE organization, it was realized that power and refrigeration equipment would eventually require complete rebuilding. When this should be done was a question that even the manufacturer couldn't answer. To the credit of the equipment design and because of the maintenance it has received, this is a question which remains unanswered today. The builder of the diesel engine had estimated that this power plant mounted in a freight car and subject to the variable loads and service conditions imposed by railroad service while operating unattended, might be due for overhaul after 10,000 hours of service. Supplied with this estimate, when one of the early cars reached 8,000 service hours, it was shopped and the engine was torn down and measured to determine the wear.

Since almost no wear had occurred, the engine was reassembled and went back into service. Another car was inspected when it had accumulated 9,000 service hours and was found in good condition. This has progressed until today cars with between 17,000 and 18,000 accumulated hours are being inspected, and are showing little wear. However, some of these units are now being rebuilt to modernize them and to spread a shopping load which eventually must come. It appears that these cars can log more than 20,000 hours before power plants must be shopped.

Fruit Growers Express already has set up its shop for the heavy overhaul program. It is located at the Jacksonville and is being equipped and arranged to handle the power plants and refrigeration units for the 1,001 cars which the associated companies operate today. Repairs are handled on a unit exchange basis with a stock of spare assemblies maintained for each of the major components. Installations of engine-generators, compressors, and condensers have been designed so that they can be removed with a fork lift truck, and so that installation of a replacement can be handled in the same way. The fact that a general overhaul schedule has not been established does not mean that none of the units has yet been removed. This fleet has had the usual condenser and radiator leaks, fan failures, and leaking oil seals. Such work is handled daily in the Jacksonville shop and in a smaller shop operated at Baldwin, Fla. The Baldwin set-up is similar to Jacksonville except that engines are not rebuilt. These units are trucked from Jacksonville when required.

The scheduled maintenance program established so far has been a factor in the excellent performance

WHAT OF THE FUTURE?

The mechanical refrigerator cars, pioneered and developed by FGE, WFE, and BRE, are successfully answering the demand of shippers of frozen foods for dependable low-temperature in transit refrigeration. Our associated Companies contract with some seventy railroads for the railroads' requirements of refrigerator cars and protective services. Our goal is to furnish mechanical refrigerator cars for all shipments of frozen foods originating on our contract lines. While the frozen food industry is growing at a tremendous rate, we are fast approaching the achievement of that goal. We plan to keep up with the growth of the frozen food industry.

Although the present supply of mechanical refrigerator cars is required almost exclusively for frozen foods, research and development to make the car a satisfactory vehicle for all types of perishable commodities have been an important part of the FGE-WFE-BRE program. Practically all types of fresh commodities have been satisfactorily transported in our "all-purpose" cars.

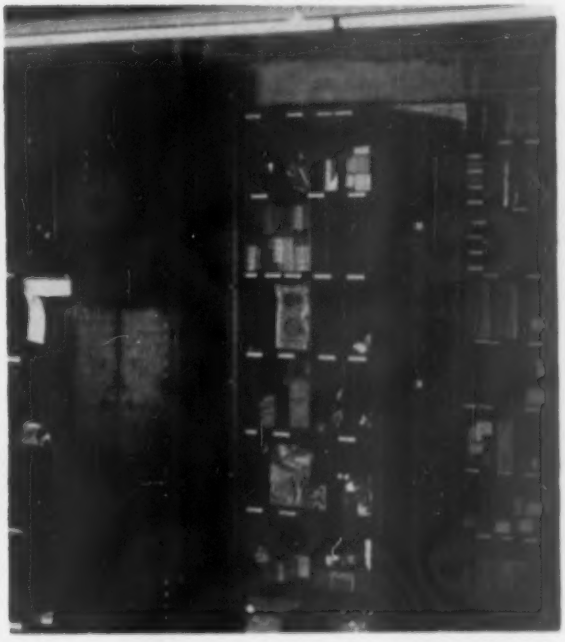
We do not feel that the ultimate in mechanical refrigeration has been reached or that the mechanical refrigerator car development job is completed. The future of this development program depends to a great extent upon justification from the standpoint of use of the mechanical refrigerator cars. We feel that the record to date justifies the confidence placed in the program.

—J. C. RILL, President
Burlington Refrigerator Express
Fruit Growers Express
Western Fruit Express

Shop at Jacksonville is equipped for making all types of repairs to mechanical refrigeration equipment. It is next to tracks where both routine servicing and repairs are done.

Cleaning vat is outside shop. This makes it possible to clean equipment after it is removed from cars and before it is moved into the shop.

Fork lift truck is used to remove diesel-alternator from early-model mechanical car. Basic units are all designed to be handled in this way.

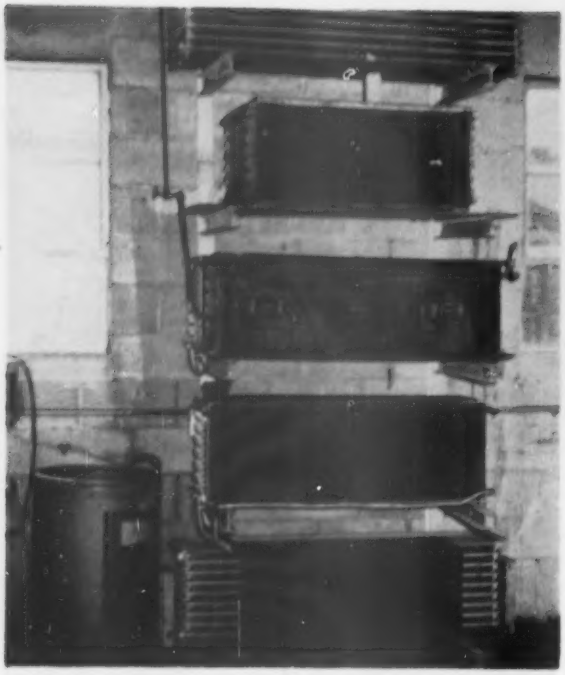


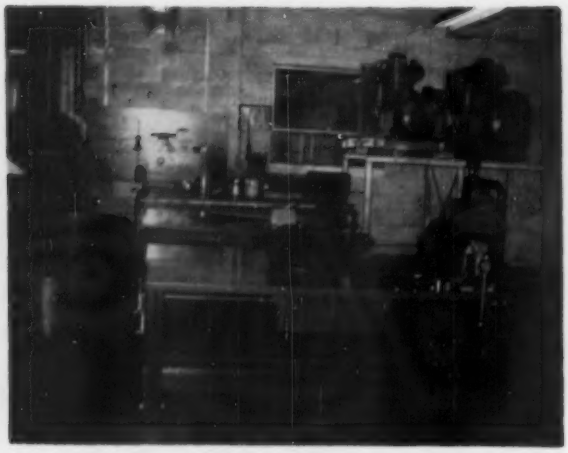
Stock of parts maintained at Jacksonville is used for making both light and heavy repairs. There is little reclaiming of parts after removal.

which these mechanical cars have given BRE-FGE-WFE. The established program does not yet call for the removal of any of the major components. The engine water pump is removed and rebuilt after 5,000 hours; but, as previously indicated, no schedule has been set for the removal of the engine itself. Because these engines operate unattended, and because failure of a cooling system could ruin a lading worth many thousands of dollars, critical parts are removed and scrapped at arbitrary periods with no attempt being made to extend their service life.

At 750 hours engine oil and the lube oil filter are changed. At 5,000 hours all belts and coolant hoses are renewed and the old ones are scrapped. At 10,000 hours flexible fuel lines and engine injectors are replaced even though inspection might indicate they could operate longer. Almost no attempt is made to reclaim parts. Injectors removed from an engine are rebuilt with new components, but no attempt is made to build up worn components. Batteries are removed and scrapped any time there is evidence that they are not maintaining their ability to take charging, and when they then fail a breakdown test. The entire preventive maintenance program so far established is listed.

The Jacksonville shop has a large work area equipped with benches, tools and tool boards, crane, and





Shop is adequately lighted and has benches and tool boards. There are jib cranes for handling the heavier assemblies during their repair.

Evaporators of various types must be stocked. They are rebuilt—leaks and defective heater rods are typical repair jobs for Jacksonville shop.

Preventive Maintenance for Mechanical Refrigerator Cars

750 HOUR INSPECTION

Diesel Engine

- Change engine lubricating oil
- Install new lube oil filter element
- Install new secondary fuel filter element
- Clean primary fuel filter bowl and element
- Clear air cleaner and add new oil
- Inspect rings, pistons and ports
- Clean air box and air box drains
- Lubricate battery charging generator
- Lubricate starting motor
- Check generator belt tension
- Grease water pump
- Check crankcase temperature when engine is hot. (If over 40-deg warmer than coolant temperature, clean the oil cooler.)
- Check safety circuit operation

Refrigeration Equipment

- Check for leaks with leak detector
- Check refrigeration control capillary lines for breaks
- Grease circulating fan bearings
- Check compressor belt tension

General

- Drain water and sediment from fuel tank

1500 HOUR INSPECTION

Engine

- Check valve lash and injector timing
- Position control racks

Power Generator

- Change alternator end-bearing oil

5000 HOUR INSPECTION

Diesel Engine

- Replace water pump with new or rebuilt unit
- Renew all belts
- Clean battery charging generator and install new brushes and bearings
- Clean and lubricate starting motor
- Renew all cooling system hoses
- Clean air inlet screen
- Change coolant solution
- Check overspeed governor

Power Generator

- Renew alternator brushes

Refrigeration Equipment

- Renew all belts
- Change liquid line dehydrator
- Lubricate electric motor bearings
- Complete leak test

10,000 HOUR INSPECTION

Diesel Engine

- Renew starter motor brushes
- Replace injectors with new or rebuilt units

Refrigeration Equipment

- Renew polarity reversing switch

General

- Renew flexible fuel lines

EACH TWO YEARS

- Paint engine room and equipment at same time entire car is scheduled for repainting

racks on which rebuilt equipment is stored awaiting application. There is an office where records on the various cars are maintained. There is a stock room where is kept the large inventory of spare parts for this car fleet. Outside the building is a solvent cleaning installation with crane equipment to handle parts and assemblies in and out of the tanks. The fork lift truck is a vital part of the operation since most of the large assemblies are handled to and from the cars in this way. This shop is adjacent to the tracks on which both the pre-trip maintenance and the heavy repairs are done. When the ACL places cars, it is usually not known what will be required. They are switched in only because they are empty and southbound. Even when there are major repairs made, many cars are able to move out the same day they arrive.

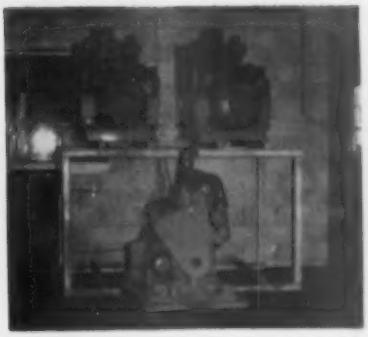
Shopping Procedure

Some practices have been fixed. There is no shopping of refrigeration compressors except in cases of failure. The entire refrigerating system, including compressors, condensers, evaporators, refrigerant lines, and related equipment, is never taken off the car except when there are leaks. When it is necessary to do this, the system is recharged with freon only after it has evacuated and dehydrated in place on the car.

The BRE-FGE-WFE organization has found that premium fuel and lubricating oils have their part in the performance which has been obtained. Because of the wide temperature extremes through which these cars operate, they are always fueled with No. 1 grade fuel oil which can successfully operate at temperatures down to 30-deg below zero. The year around, SAE 30, high-detergent lubricating oil is used. The engine cooling system is permanently filled with a 50-50 ethylene glycol antifreeze solution. Compressors are always lubricated with No. 6 Ansul oil.

The organizations, programs, designs, equipment and materials established as standard for this relatively new operation have produced results which have not only satisfied the BRE-FGE-WFE management, but more important, are increasingly popular with shippers and consignees. Mechanical refrigeration is holding and winning traffic for the railroads.

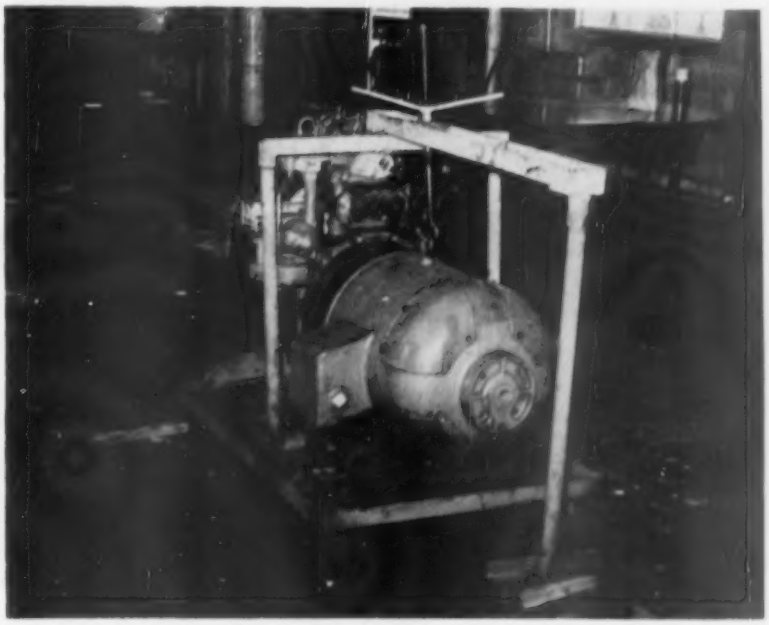
Batteries and resistance heater rods are stocked along with other parts. Importance of battery has meant no great attempt to extend its life.



Diesel-alternators are stored on racks after repair. They can then be handled directly with fork lift truck when they are to be installed on the car.

Diesel engine assembly work is done on this positioning unit. Still under way is study to determine shopping period for these engines.

Run-in for rebuilt refrigerant compressors can be done on this bench with compressor belt driven by electric motor. Compressor rebuild is not scheduled yet.



Replacing seal between alternator and engine can be done with this FGE-developed device demonstrated here on shop floor.

"Coordinated" Draws 2,400 Registration

The 1956 convention, at Chicago, attracts almost 1,600 railroad men in non-exhibit year

A total of 2,432 persons registered at the convention of the Coordinated Mechanical Associations at the Hotel Sherman, Chicago, during the three-day sessions of the four mechanical associations. Of this total 1,589 were railroad men; the remainder, representatives of the Allied Railway Supply Association's member companies. There was no exhibit in connection with this year's meetings. Last year, when there was an exhibit, about 700 more supply company registrations brought the total to over 3,200. The table on the opposite page gives the statistics of registrations for the years 1951-56 inclusive.

The Locomotive Maintenance Officers' Association led the railroad group registrations with a total of 652, followed in order, by the Car Department Officers', with 353; the Railway Fuel & Traveling Engineers' group, with 289, and the Air Brake Association, with 275.

In the "Guide" below, on this page, is listed, for ready reference, the abstracts of reports which appear in this 14-page section. Other reports, not included in this issue, will be dealt with in subsequent issues.

AIR BRAKE ASSOCIATION

	Page
Stuck Brakes—Avoid Overcharge	67
Braking with Composition Shoes	68
Slack Adjuster Situation Studied	69

LOCOMOTIVE MAINTENANCE OFFICERS ASSOCIATION

New Reclaiming Methods Are Under Test	72
Visual Aids Fit Today's Training Needs	73
How Relay Failures Can Be Reduced	85

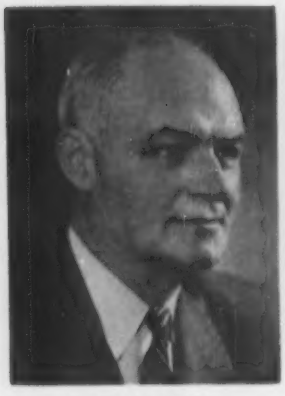
CAR DEPARTMENT OFFICERS ASSOCIATION

	Page
Paint Shop Operation	70
Car Men Recommend AAR Rule Changes	71
CDOA Plans for Mechanical Reefers	71

RAILWAY FUEL AND TRAVELING ENGINEERS' ASSOCIATION

Slack Control Is Train Handling Key	74
Economy Fuels Pose Many Problems	75

Presidents of the Coordinated Mechanical Association 1955-56



D. R. COLLINS
D. & R. G. W.
AIR BRAKE

J. F. LIKARISH
GREAT NORTHERN
C. D. O. A.

T. T. BLICKLE
A. T. & S. F.
L. M. O. A.

E. L. REEVES
B. & O.
R. F. & T. E. A.

The Car Department's Job . . .

J. M. Budd, Great Northern, before C.D.O.A

Men who are in charge of freight and passenger cars are dealing with about 25 per cent of the total investment in operating property. Out of a total investment of about 30 billion dollars in operating property, nearly 7 billions are invested in freight and passenger cars. This is a sizeable amount of property, even in these days of astronomical figures. In maintaining this equipment you men in charge of the car department are responsible for quite a

(Continued on Page 77)

"Safety Is No Accident" . . .

John A. Hall (I.C.C.) before the L.O.M.A.

Prior to the mandatory inspections required by law, all railroads had some form of locomotive inspection procedure, but in many cases the inspection requirements were more of an advisory or objective nature than an absolute requirement. If expediency or the opinion of local operating officials dictated, the inspections could be, and often were, postponed to a time more convenient from an operating standpoint.

(Continued on Page 77)

Diesels Do Today's Job . . .

W. M. Keller (AAR Mech. Div.) before the L.M.O.A. The diesel locomotive has done a good job, but we are on the lookout for still better power. It is doubtful that the diesel engine, as we know it today, will not be made obsolete by improved power of some other type. The steam locomotive lasted about 100 years. If the diesel were to remain with us for the same length of time, it would begin to be replaced in the year 2034, or about 78 years from today. It is safe to predict that it will be replaced much sooner.

Charlie Weil

"Retiring" To New Fields . . .

The Chicago coordinated conventions suffered a real loss when, on November 1, Charlie Weil "retired" as the executive secretary of the Allied Railway Supply Association and secretary of the Committee of the Coordinated Mechanical Associations. Charlie has the distinction of having retired twice, once from the American Brake Shoe Company in 1952 after 47 years in the sales end of that business and, now again, after almost 10 years as secretary of Allied Railway Supply. He was president of that organization from 1943-1946. Now he is leaving the Chicago area to make his home in California and, believe it or not, to go into business again out there. He is giving up the accounts which he has had for the past four years. Probably no single individual deserves more credit than Charlie Weil for the success of the Chicago meetings and literally hundreds of friends in the railroad and railway supply business will miss him as the "master of ceremonies" of the big show at the Hotel Sherman. We all wish him the best of everything in his newest business venture in California.—H. C. W.

Registration at September 1956 Coordinated Mechanical Meetings

Association	Sun.-Mon. Sept. 9-10	Tues.-Wed. Sept. 11-12	Total 1956	Total 1955	Total 1953	Total 1952	Total 1951
Air Brake	241	30	275	169	192	135	280
Car Department Officers	290	63	353	433	520	523	563
Locomotive Maintenance Officers	531	121	652	717	950	840	1,017
Master Boiler Makers	——	——	——	——	172	127	215
Railway Fuel and Traveling Engineers	266	23	289	267	322	433	268
Electrical Section, AAR	——	——	——	——	——	205	155
Railroad total	1,328	237	1,569	1,586	2,156*	2,263	2,498
Railroad guests	17	3	20	110	——	361	——
Allied Railway Supply	774	69	843	1,522	869	1,003	1,152
Railway Electric Supply Manufacturers'	——	——	——	——	——**	305	168
Grand Total	2,119	309	2,432	3,218	3,025	3,932	3,818

*Electrical Section met at Atlantic City.
**Atlantic City Convention in June and no exhibit at Chicago in September.

NOTE: No Chicago meeting in 1954.

Officers Coordinated Mechanical Associations 1956-57

Committee of the Coordinated Associations

Chairman: J. L. Robson, chief mechanical officer, Great Northern

J. A. Welsch, general superintendent motive power, Illinois Central

T. T. Blickle, general manager-mechanical department, Atchison, Topeka & Santa Fe

Executive secretary and assistant treasurer: Appointment not made time of going to press

(Committee includes also the president and secretary of each of the coordinated associations)

Air Brake Association

President: R. J. Dewsbury, general air-brake inspector, Chesapeake District, Chesapeake & Ohio

First vice-president: C. C. Maynard, general supervisor air-brake and steam-heat equipment, Canadian National

Second vice-president: L. A. Stanton, general air-brake supervisor, Great Northern

Third vice-president: A. M. Malmgren, general diesel and air-brake supervisor, St. Louis-San Francisco

Secretary-treasurer: Lawrence Wilcox, Room 827, 80 East Jackson Boulevard, Chicago

Car Department Officers Association

President: H. M. Nelson, general mechanical superintendent, Fruit Growers' Express Co.

Vice-presidents:

H. L. Hewing, superintendent of interchange, Chicago Car Interchange Bureau

K. H. Carpenter, superintendent car department, Lackawanna

J. F. McMullen, superintendent car department, Erie

C. E. Barrett, superintendent car department, Chicago, Milwaukee, St. Paul & Pacific

Secretary-treasurer: F. H. Stremmel, (assistant to secretary, AAR Mechanical Division), 6536 North Oxford avenue, Chicago

Locomotive Maintenance Officers' Association

President: J. T. Daley, superintendent motive power, Alton & Southern

First vice-president: F. E. Molloy, superintendent motive power, Southern Pacific

Second vice-president: F. R. Denney, mechanical superintendent, New Orleans Union Passenger Terminal

Third vice-president: E. V. Myers, superintendent motive power, St. Louis Southwestern

Fourth vice-president: W. E. Lehr, superintendent motive power, Lehigh Valley

Secretary-treasurer: C. M. Lipscomb, general clerk to terminal master mechanic, Missouri Pacific, 1721 Parker street, North Little Rock, Ark.

Railway Fuel and Traveling Engineers Association

President: T. J. Conway, transportation assistant, Texas & Pacific

First vice-president: O. D. Teeter, assistant freight traffic manager, Denver & Rio Grande Western

Second vice-president: C. R. Patterson, regional locomotive fuel supervisor, Canadian National

Third vice-president: C. M. Moddrell, system supervisor, fuel and locomotive performance, Northern Pacific

Secretary-treasurer: L. H. Peters, 139 West Van Buren street, Chicago 5

Allied Railway Supply Association

President: Bard Browne, railroad representative, Leslie Co.

First vice-president: C. R. Busch, vice-president and manager sales, Unit Truck Corp.

Second vice-president: George L. Green, vice-president, Pullman-Standard Car Manufacturing Co.

Third vice-president: H. C. Halberg, president, Waugh Equipment Co.

Secretary: C. E. Grigsby, vice-president—sales, American Steel Foundries

Executive secretary: R. E. Coughlan, chief metallurgist and engineer tests, Chicago & North Western (retired)

Treasurer: D. I. Packard, president and general manager, Brandon Equipment Co.

Air Brake

Stuck Brakes . . . Avoid Overcharge

Stuck brakes caused by inadvertent overchange in the brake equipment are a source of train delays, equipment and lading damage, and possible injury to train crew members. The Manhattan Air Brake Club report to the Air Brake Association originally was started when a member reported cases of stuck brakes on 140 car trains after leaving a yard where they were made up by a switcher that was finally found to have its feed valve set 10 psi higher than those on the road locomotives. The roads rules require that switchers have feed valves set at 70 psi and road units adjusted to 80 psi.

The AB valve is designed so that during brake pipe reductions only the piston and graduating valve move to close the charging ports and bring the stabilizing spring stop into contact with the service slide valve. A slight further movement of the piston and graduating valve compresses the stabilizing spring and also initiates quick serice. Because of the small amount of resistance offered by the graduating valve, there must be only a very slight pressure differential across the service piston to move it to the quick service position. Quick service consequently can result from low initial brake pipe reductions.

Another AB valve feature is the quick recharge. This is accomplished by allowing the higher pressure stored in the emergency reservoir to flow back to the auxiliary reservoir when the service piston and slide valve return to release position following an application. The rate of recharge from the emergency reservoir is such that there is little flow of air from the brake pipe to the auxiliary reservoir until equalization occurs between the two reservoirs.

Incidents of stuck brakes in which overcharge was involved indicate a relationship with both the quick service and quick recharge functions. Under normal conditions when brake pipe pressure is reduced below auxiliary reservoir pressure a sufficient amount at the required rate, a brake application will occur. On the other hand, if in some manner the auxiliary reservoir pressure were increased above brake pipe pressure a sufficient amount, a brake application would also occur.

When the valve moves position, the emergency reservoir facilitates recharge of the auxiliary reservoir. An overcharge in the emergency reservoir will flow to the auxiliary reservoir until it also has a pressure slightly higher than that in the brake pipe. This pressure differential may be sufficient to move the service piston and graduating valve toward the service position. During a brake application this initial movement is made more positive by the extra volume of the emergency reservoir connected to the auxiliary reservoir throughout the service slide valve. With overcharge, piston movement will close the feed groove and the graduating valve will prevent further flow of emergency reservoir air to the auxiliary reservoir. Characteristics of individual AB valves will cause the service piston and graduating valve position to vary.

In some cases the graduating valve

Overcharging Freight Train Air Brakes . . .

Causes . . .	Remedies . . .
A. Assembling train in yard or changing consist enroute may result in over charge of rear portion of the train when . . .	
Cuts of cars are classified on more than one track and each section charged to one standard pressure.	Set yard charging regulating devices 10 psi below road operating pressure. Terminal test must then be made after road locomotive is on the train.
Short train has cars added to head end at an intermediate point.	Remove overcharge by following: (a) A full service 25 psi brake pipe reduction and release will reduce an overcharge by approximately 7 psi. (b) An emergency application and release will reduce an overcharge by approximately 14 psi. (c) Reservoirs on individual cars can be drained manually.
B. Overcharge can exist in reservoirs charged to excessive pressure by one or more of the following prior to train departure . . .	
Yard locomotive has feed valve set higher than standard pressure.	Usually feed valve will not be set so much higher that overcharge will not be eliminated during terminal brake test. If it has been, adherence to operating pressures should be stressed.
Failure of personnel to readjust feed valve after completing previous duties requiring higher brake pipe pressure.	Observance of instructions, and emphasis on their importance.
Erratic feed valve or yard air line regulator caused by mechanical failure, moisture, or sludge.	Periodic changeout of regulating devices, use of automatic drain valves, and adequate radiation.
Brake pipe, equalizing reservoir, or yard air line gauges out of adjustment, and excessive pressures being maintained.	Periodic replacement of air gauges in accordance with regulations, or more often if necessary.
Insufficient volume in yard charging facilities, resulting in lower-than-standard pressures during initial charging for test. Under these circumstances the regulating device may be adjusted to standard pressure resulting in excessive yard line pressure when demand diminishes.	Yard facilities should be designed to provide a large storage volume. Train charging and air-consuming devices must be considered. With adequate storage, personnel should be notified that regulating devices are not to be tampered with.
C. Improper use of brake valve by engineman can overcharge front cars of train . . .	
Improper use of full release position when charging or recharging after a brake application.	Instruct engineman in proper use of full release, or if locomotive is equipped, use controlled release position.

will open the preliminary quick service port and cause a continuous blow of brake pipe air at the quick service volume exhaust. As this is a choked exhaust and the brake pipe is being charged, a balanced condition exists and no further piston movement will take place.

Further movement of the service piston from this balanced condition may result from slight fluctuations of brake pipe pressure. The brake cylinder exhaust can then be closed, and a brake application may be initiated. Leakage of emergency reservoir air past the graduating and slide valve to the auxiliary reservoir can cause this movement.

Conditions which could cause variable service piston movement might be stabilizing spring strength, service piston ring friction or leakage and slide valve and graduating valve friction or leakage. Other possible causes include condition of feed grooves and charging ports, capacities of ports in the slide valve and seat, volume and location of system leakage, individual car vibration, slack action, and running brake pipe leakage.

Common causes for overcharge and possible solutions are shown in the accompanying table. Three methods for removing a suspected overcharge are indicated. The paper called attention to the fact that overcharge on an individual car is the difference in pressure between the reservoirs and the brake pipe. If a locomotive with a 70 psi feed valve setting is charging a train which has a car that has reservoirs charged to 80 psi, the overcharge is not 10 psi, but is the difference between the reservoir pressure and that of the brake pipe on the car concerned. If this brake pipe pressure were 61 psi, the overcharge would be 19 psi.

During discussion additional methods of removing overcharge were discussed. One speaker said that on his road yard locomotives charging 125 to 170 car trains had feed valves set 20 psi under the road locomotive setting. A Southern Railway representative asked what causes stuck brakes in trains which may have operated for 200 miles and had sufficient brake applications and releases to remove initial overcharge. J. L. Stanton, Great Northern, said that two possible causes were a sluggish locomotive feed valve, and leakage or vibration on a car causing quick service action. The question of whether AB brakes are cleaned frequently enough to be used in 150 to 190 car trains was raised. Leakage on cars could be reduced by more thorough leakage test during terminal testing according to one speaker. He also said that oil carryover was a major problem. It was brought out that the present 36-month brake cleaning was a compromise from a 48-month period proposed when the AB brake was introduced, and that the cleaning period is now being studied.

F. G. LaMaster, Burlington, described a compressor test which indicated that air demand increases while a train is running and apparently leaks open up. F. Merriman, C&NW, cited a train handled by a locomotive with a flow meter. On each curve the meter indicated excessive leakage. Both examples were intended to show why sticking brakes might develop on a train long after it has left its initial terminal.

Braking With Composition Shoes

P. O. Willaman, for Air Brake Division of Westinghouse reviewed briefly the progress of railroad braking systems for the Air Brake Association. In presenting this report he offered these points of consideration. Higher schedule speeds, resulting from improvements in rolling stock with emphasis on the "lightweights" have created new demands on braking and amplified the limitations of existing systems.

As the friction of conventional brake shoes is far less at higher speeds than at lower, a number of devices have been offered to compensate for this condition. Of these, the speed governor control was given as an improved method of attaining high speed performance with the least likelihood of wheel slide.

It was his belief that concentrating on a new material for a brake shoe has resulted in the most satisfactory system. The resulting composition shoe is now available for railway use.

The variation of friction value in these shoes is declared uniform. Constant retardation is maintained with a slight increase toward the end of the stop. The reason for this is to take advantage of the increase in rail adhesion at decreasing speed and to provide a positive "feel" of retardation which is considered essential.

The variation of friction value between light and heavy shoes is slight. Nearly the same stopping distance is realized for all cars by proportioning the shoe pressure to the weight of the car. This obviates the speed governor control because the retarding force with composition shoes is uniform throughout the speed range.

Mr. Willaman went on to describe the high friction values of composition brake shoes and stated that only 1/3 to 1/5 the forced used with a conventional shoe is required. Lower force requirements result in lighter equipment. In addition to an estimated weight reduction of about 3,000 lb, on a passenger coach, the lower forces cause less wear on pins and bushings, reducing rigging maintenance. The lighter equipment can reduce the air requirements; this is particularly beneficial in freight service.

It is claimed that shoe life is increased four to five times that obtained with conventional shoes and wheel mileage between turning is lengthened as much as 90%. The proposed material permits brake shoes to be worn close to the thickness condemning limit. There have been no reports of burned brake heads on cars equipped with composition shoes.

The uniform contact between shoes and wheel is known to distribute the braking heat evenly over the wheel tread area, minimizing the possibility of thermal damage. Although it was once thought that brake shoes must be good heat conductors, composition shoes are heat insulators. Since the shoe dissipates only a small amount of heat as compared to the wheel, it has been reasoned that uniform contact between the shoe and the wheel is more significant.

Reliable performance of a composition shoe can only be achieved if the friction material used is stable under a wide range of atmospheric conditions, including extremes of temperature as well as wet weather. Nine complete trains on nine different railroads equipped with composition brake shoes are consistently meeting existing braking standards, wet or dry.

Existing cars are said to be easily converted to the use of composition shoes. Because of the high friction, the braking forces for conventional shoes must be lowered. This is affected by substituting smaller diameter cylinders or bushing the existing brake cylinders. In many cases on older equipment the reduction can be obtained by a simple lever ratio change.

Breakaway tests show that a nominal braking ratio of 50% with composition shoes will give stopping performance equivalent to that obtained with conventional brake shoes and speed governor control, for most passenger service.

This braking ratio results in a reported reduction to 1/5 the maximum

braking force required with conventional brake shoes if the speed governor control is used and to 1/3 the force normally used if the car does not have speed governor control.

Designers should note that composition brake shoes can be used to their fullest advantage on the lightweight, high speed passenger trains that are coming into the picture. Because of new concepts of construction, these cars and power units provide economical service by reducing the cost per passenger carried. Nearly all the lightweights under construction are equipped with composition shoes. The single shoe type brake has not been overlooked in this area of car development inasmuch as it often suffices where clasp brakes were formerly a necessity.

Locomotive brake requirements on lightweight trains are more demanding. The weight of the motive power on most of these trains approaches and sometimes exceeds the weight of the cars. Composition brakes are claimed to have met these requirements. Although most of the paper was devoted to passenger applications for composition shoes, they also could have application to freight service.

Discussion

"The natural abrasive action of this type of brake shoe is still a problem," according to R. Wilson of American Brake Shoe. "It tends to form a pattern of wheel wear that is different from what we are used to seeing . . . low points on each side of the wheel path, resulting in a high flange condition. A wheel gauge for composition shoes must be developed. . . . Since a greater amount of material must be removed to restore a normal contour we lose the turnings needed to end up on the plus side of overall wheel life. The nonconductivity of composition shoes tends to create thermal crack in B and C class wheels. The wheels take on a mirror-like surface. This is only good as long as we have a dry track, but adhesion decreases under adverse weather conditions.

"There is the question of interchangeability of the shoes on the same head with iron shoes. If we reduce the braking power for compositions, the substitution of conventional shoes in various places could result in seriously under-braked train. At present the main brake head will refuse a metal shoe. This shape of the shoe will not go on conventional heads. Conversely, placing composition shoes on a metal shoe head would over-brake the wheels. Composition shoes tend to over-brake at high speeds and under-brake at lower speeds. Iron shoes are stronger than the compositions, which do not withstand the slapping around associated with loose rigging etc. We have found large pieces missing even when the rigging has been well maintained. We feel that with continued research we will be able to work things out. We do not think we are at this stage for general railway service as yet."

Railroad tests reported during discussion included the Santa Fe with two cars of the 14-car "Chief", the Missouri Pacific with five cars of the "Colorado Eagle", and the New York Central's complete "Xplorer" and "Aerotrain". Several users reported difficulties with the shoes—breaking up during shipping or in service, and loss of effectiveness when braking on long grades if the brake application is not gradually increased during the descent. Other members said that advantage should be taken of the lighter brake rigging and equipment possible with these shoes, and that the composition shoe is an almost inevitable development in passenger service. Discussion was closed by P. O. Willaman, "The full advantages of composition shoes are best shown in full train operation However, it is possible to get a relatively good match, especially with disk-brake cars, because of similar frictional characteristics. Several have mentioned the crack at the center of the shoe. I would like to point out that cracks anywhere in the shoe do not hurt the shoe. A number of these cracks, especially at the center, are experienced during molding; others happen during shipment and have no adverse effect on the shoe."

Slack Adjuster Situation Studied

Brake rigging adjustment is very important from an economical and technical standpoint. The overall picture was presented by F. G. LaMaster, C.B.&Q., in his Air Brake Association report titled "The Value of Automatic Slack Adjusters on Freight Cars."

Slack adjusters are used in the system to limit the brake cylinder piston travel as recommended by the AAR. As brake shoes wear, more than a normal travel is required to apply necessary braking force. If it were not for adjustment, nothing would prevent the piston from going to full stroke. By allowing the piston to contact the non-pressure head of the brake cylinder a complete loss of braking could result. Slack adjusters also provide a means of retracting the brake beams to permit the replacement of worn brake shoes. They are safer because men are not normally required to go under cars to make adjustments. Increased efficiency in braking power is assured by uniform piston travel. There is usually no need for adjustment during the life of the brakeshoes, expediting train movement. A full 1½-in. shoe wear usually can be realized without any manual adjustment.

As a basis of comparison, three types of slack adjusters are to be considered —the multiple hole fulcrum, the automatic single acting, and the automatic double-acting types.

The multiple hole fulcrum involves eight staggered brake pin holes evenly spaced. Movement of the floating lever fulcrum will cause a similar but opposite movement at the brake cylinder piston. A specific movement of the fulcrum reduces piston travel the same amount. This method leaves much to be desired as it compensates for only 7½-in. of the required 15¾-in. adjustment. In addition the fulcrums must be continually adjusted throughout the car once the holes in the floating lever fulcrum are used. Replacing brake pins to their initial positions when replacing brake shoes and wheels is still another disadvantage.

Truck brake pin movement variation often causes confusion resulting in improper brake adjustment.

Automatic slack adjusters, on the other hand, will take up varying degrees of running piston travel. Relative movement of the truck in relation to the car body creates a motion considered to be 1½-in. more than standing piston travel. This is the reason both automatic and manual adjusters should have a standing piston travel at least one inch less than the desired running piston travel.

The A and B end truck dead lever anchors should never be on the same side of the cars. Left and right hand trucks have a habit of developing either excessively long or short piston travel if the brakes are applied on a curve, affecting all slack adjusters. Automatic slack adjusters will adjust for the excessive travel if brakes are applied on a curve, unlike the manual type which simply increase or decrease piston travel. Many roads do not adjust the manuals until the standing piston travel is a least nine inches, reducing theoretical braking ratio. The committee believes that AAR General Data of Automatic Slack Adjusters, Paragraph G-6 should read, "When automatic slack adjusters are applied to car, manual adjustment features on the brake rig-

ging *must be eliminated*", and that AAR Rules should state the brake shoe size to be used. It was pointed out that a 10.5 to 1 brake lever ratio with 1½-in. shoes requires 15¾-in. piston travel adjustment while the same ratio using 2-in. shoes requires a 21 in. adjustment.

Some automatic adjusters permit large increments of take-up; others are extremely small. Large or small increments of take-up have their advantages and disadvantages. If take-up is too small, a brake shoe is lost. However, it is debatable whether the short travel is undesirable. One advantage is that it develops increased braking power and represents savings in air volumes. On the other hand, it increases the possibility of wheel slide on an empty car because of the higher braking force produced.

The double-acting type of automatic slack adjuster has the advantage of compensating for long or short piston travel, as well as for the replacement of brake shoes without any manual adjustment. The ultimate in slack control would be an adjuster that would give the proper piston travel regardless of what happens to the shoes or rigging.

C.D.O.A.

New Materials and Methods Speed Paint Shop Operation

With present day competition, railroad painting operations are faced with an ever-increasing demand from management for better looking passenger and freight cars, and for less time consumed to make them look better. Material and labor costs must be cut, and more durable and longer lasting paints must be used. The CDOA committee on painting stressed the importance of adequate specifications and quality control.

A number of new coating materials have been used in railroad paint shops.

VINYLS offer excellent resistance to acids and alkalines—are widely used for covered hoppers. Vinyls should be applied to very clean surfaces, usually in a four-coat system with standard spray equipment using lacquer-resistant hose. Adhesion is good and a cement car under normal conditions will usually average 2½ to 3 years in service.

EPONS, newer than vinyls, have similar uses and properties. With special handling, some types are used with no primer. Epons have "excellent" adhesion and it is possible to apply 2 to 3 mils per coat. Films are flexible and abrasion resistant.

NEOPRENE, a synthetic rubber coating, must be applied to specially cleaned surfaces and a special primer is used. It is possible to build up to 20 mils thickness by spray or roller coating for special applications—this is done with several coats. Neoprene offers corrosion and abrasion resistance.

DIRECT-TO-METAL PAINT, a newcomer to the field, makes possible application of only one coat without any primer. Material can be applied hot or cold and good film thicknesses can be obtained with one painting. Rust inhibiting pigments are incorporated in some formulations which at the present time are made for box cars. All surfaces to be painted should be cleaned and preferably sandblasted.

PLASTIC SHEET coatings for interior coverings in passenger cars come in various textures and colors, and are applied using new synthetic adhesives. Initial cost is high, but the material is easy to apply and clean, and has long life and excellent appearance.

The committee reported on a few new methods and equipment available for application of protective materials.

HOT SPRAY painting requires a heater, and special paints are preferable. Initial cost of the equipment is slightly higher than conventional equipment but considerable savings may be realized from reduction of overspray, and because with coats because it is possible to get greater dry film thicknesses per coat. In order to successfully use this method of painting, it is very important that the work be carried on inside a building and that the building be heated to a normal room temperature and the cars warm.

AIRLESS SPRAY equipment, available, but costly, reduces overspray if the paint being used is specially formulated for this equipment. Paint is heated and atomization is obtained by pressure. Special nozzles are necessary to vary pattern width. There can be no triggering. The method is especially good for flat surfaces.

STEAM SPRAY equipment offers "excellent" possibilities. Initial purchase of the equipment (steam generator, steam superheater and special guns) is costly; but the possible savings in paint used may pay for this equipment. There are royalty considerations involved in this process which must be taken into account.

Lettering and Stencilling

Reflective sheeting material is now being used on some of the equipment for both lettering and decorating. Some trouble has been experienced when attempts are made to repair lettering after being in service because it can not be matched. Spray application has now been extended to the lettering of railroad equipment. The die cut pressure sensitive stencil is an ideal tool for reproducing lettering designs, medallions, numerals, etc., on both interior and exterior surfaces, because the stencil represents 80 per cent of the work required and no lettering skill is necessary. A pure gum latex pressure sensitive adhesive type stencil is recommended. Because it is die cut to customer specification, this type stencil remains constantly accurate and can be used for either surface or depressed lettering.

Depressed lettering is accomplished by spot spraying letter color first, allowing to dry, and then applying stencil prior to spraying final color. This type lettering is preferred because it withstands the action of car washing equipment more readily than the usual surface type lettering. This same type stencil can also be used for etching stainless steel, glass, plastic or aluminum surfaces. Fine grit sand and relatively low air pressure will produce an adequate "tooth" for paint on these hard-to-bond finishes. In roll form this material is ideal for striping since it cannot stretch or distort.

It is desirable to obtain a more attractive paint job on all railroad equipment. There is no better means of advertising than that of having attractive equipment before the eyes of customers. New products and practices all help to apply better paints with less labor and painting materials, but the master painter is still faced with the problem of training new men and sometimes using inexperienced men to do a mechanic's job, as few apprentices have been trained in recent years. A continuous training program should be instituted so experienced painters will be available at all times.

Multiple-Colored Cars

During discussion one speaker stated that the real test of paint was its appli-

cation in winter—that almost any material can be successfully applied in warm weather. He went on to say that there is a big loss in putting cheap paint on rolling stock because the labor charges are the same. Brightly colored freight equipment is going to take cleaning and requires higher quality materials. More time must be allowed for finishing rolling stock in more than one color. F. W. Vogel, D&RGW, stated that the road is now using the same materials and methods for painting cabooses that it uses on passenger equipment. The Rio Grande undercoated the steel ends of recently-built stock cars rather than lining them, and Vogel said another road had used a neoprene paint for this purpose.

The problem of removing old paint from passenger cars and diesel locomotives was discussed. Electrical equipment usually makes sand-blasting undesirable. Some successful experience with chemical strippers was cited, and a major problem is adequate cleaning to remove the residue of paint and stripping compound.

Car Officers Recommend AAR Rule Changes

Limit on permissable variation in diameters of multiple-wear steel wheel sets applied to a car was one of the recommendations which the CDOA committee on interchange and billing proposed. This new paragraph for Interchange Rule 70 would prohibit substitution of wheels as small as 29½-in. in a truck with 33-in. wheels. The permissable variation would be 1¼-in., and is intended to avoid increased stress and wear on center plates and other truck parts and to eliminate the expense of maintaining coupler height on cars which now can have wheels of widely varying diameters.

Other interchange rule proposals affecting running gear would include an addition to Rule 65 making damage to boxes and side frames caused by journal overheating an item of delivering line responsibility; and a change in Rule 66A making it owner's responsibility for bearing failure on cars which have no roller bearing filler plug or grease gun fitting, or on cars where filler plugs are welded. Rule 101 should be amended to provide a charge for application of the journal box dust guard plug, and this item should be eliminated from Rule 108, according to the committee. Passenger Car Rule 22 would provide a charge for 18-in. brake shoes.

Turning of journals as specified in the special controlled-clearance supplement of the AAR Wheel and Axle Manual should be eliminated according to the committee on wheel shop practice. Present requirement is that axles smaller than 0.250-in. under new diameter must be turned to the condemning limit which is 0.375-in. under the new size. According to the committee this means a loss of production, and an unnecessary waste of journal material. Another axle recommendation would expand Wheel and Axle Manual paragraph 216 to call for a more thorough examination of axles used with roller bearings for roundness and concentricity at the back fillet of the journals, at the wheel seats, and at the center of the axle. The possibility of mounting roller bearings on eccentric journals of second hand axles in high mileage, high speed service can lead to disastrous failures according to this committee.

Air Brake Recommendation

The sixty-day provisions of Section (i) of Interchange Rule 60 should be increased to 120 days, according to the interchange and billing committee, because "all cars are carrying improved types of air brake equipment and repairing roads should be required to guarantee their work." A change in Rule 2 would exempt loaded refrigerator cars with missing side doors from the provision of par. (f-8) which now prohibits transfer of lading. The committee's tank car recommendations would affect Rule 23 which would specify that no welding could be done on tank car hand rails, and Rule 30 and the Manual of Standard and Recommended Practice wherein it would be permissable to stencil the light weight of a tank car on either the upper or lower part of the tank. This last has been recommended because the lower parts of tanks become dirty and the lightweight stencil cannot be read.

Loading rule changes recommended by the committee on loading rules take into consideration some special loading arrangements used by the armed forces. Transformers loaded on flat cars are being delayed because of broken tie down rods and the committee would specify rods with formed eyes attached to transformer lugs with 1-in. bolts. Steel strip less than 12-in. wide and in coils 54-in. high is being loaded according to Figs. 33 and 34 in Pamphlet MD-1. The committee would like to see shippers required to load this material according to Fig. 32 which should not become disarranged through band breakage. Steps also should be taken to remove sharp edges from the stake pockets on flat cars when they are on repair tracks for other work. These edges would then no longer be a source of band breakage.

The committee on loading rules asked that consideration be given to issuing the loading rules in loose-leaf form to simplify their revision. Another item would be adoption of a standard excessive dimension card for open top loads. These cards would be applied by the originating road haul carrier and would give the height and width dimensions in excess of published clearances. As the same time a standard method of measuring high and wide loads should be outlined.

This committee made a general recommendation that a larger supply of bulkhead flat cars would do much to attract lumber, plywood and wallboard traffic. They laid many of the shifted open top loads to defective or worn draft gears, to inadequate or missing snubbing devices, and to flat or out-of-round wheels. Another source of open top load shifting is Operating Department handling. The committee cited the humping of double or triple loads of poles and timbers. Finally the committee reported that most shippers are extremely cooperative when offered assistance in loading and securing shipments.

CDOA Plans For Mechanical Reefers

Railroad responsibilities in handling mechanical refrigerator cars were discussed by a CDOA committee. At that time 2,027 cars were in operation and 529 were on order. Refrigeration equipment for these cars had been supplied by Carrier, Frigidaire, Saylor-Beall, Thermo-King, Trane and Waukesha. Diesel engines used on these cars include Caterpillar, General Motors, Hercules, International, Nordberg and Thermo-King.

The special CDOA committee urged standardization of servicing techniques to produce uniform, prompt and efficient handling of the cars, and to preserve harmony between all concerned with their operation. This would insure that all railroads would perform the same standard of work on all cars regardless of owner, and assure owners that their equipment is being given sufficient maintenance. Shippers would be protected because cars would be adequately prepared for service. Prices could be established for repair and

servicing, and the latest equipment and techniques would be mandatory at all locations. Special items not common to all cars, and equipment under warranty would receive proper servicing. Finally, standardization of inspection and servicing would serve as a guide for railroads which have not yet had much experience with the cars, and would allow manufacturers to design equipment knowing what servicing it can be expected to receive.

Another portion of the committee's assignment was to prepare a standard list of supplies for servicing the various types of equipment. This is important to prevent failures, to assure the proper grades of material are used and not mixed if this is detrimental, to minimize stocks, to guide railroads not now owning cars, and to make manufacturers build future equipment which will operate on supplies now carried in stock by the railroads. Work on supply specifications continues.

Finally the committee recommended a number of steps which should be taken by railroads and car lines to train and inform their personnel so that they will be prepared to handle the rapidly expanding fleet.

L.M.O.A.

New Reclaim Methods Are Under Test

Revision of methods for restoring and reclaiming diesel locomotive parts have been a matter of continuing study by a committee on diesel material reconditioning and control of the LMOA. This committee has reported on the present status of many of these processes.

Ni-Resist Inserts—Alco 244 Pistons. The 1955 committee report detailed application of carriers equipped with a Ni-Resist insert as the top compression ring groove material. Pistons so equipped have accumulated age and service mileage to allow evaluation. Certain bond deficiencies between insert and parent carrier metal, a manufacturing problem, have been pin-pointed and corrected. Application procedures have been perfected to the extent that losses due to application method are avoided if instructions are followed and the proper facilities provided.

Carriers are supplied by several manufacturers and vary as to contour of the piston body fit bore. One type is straight faced, the other a step fit. Either shape will go in place readily if a thermostatically controlled electric furnace is used as a heat source for expansion and the recommended soaking time observed. Seal welding can be performed by either the tungsten arc or metallic inert gas method. Costs are lower under the metallic arc method where quality justifies the initial equipment investment. Service experience to date indicates that life of Ni-Resist insert ring grooves will far exceed the aluminum type. One road, where 80 pistons with varying service periods from 3 to 18 months were examined, found grooves varying only 0.0005 in. to 0.001 in. Losses in all cases reported were due to extraneous causes such as broken valves, low water or oil supply failure. Indications are that the inserts will increase piston life. At least double present service life should be commonplace, and wear of the second ring groove will govern the service life. Cost of reclamation will approximate the following: outside rebanding—56 per cent of new piston cost; in shop rebanding—42 per cent of new piston cost.

Piston Carriers for EMD Engines. Piston carriers on EMD engines are subject to wear on guide lands with the greatest wear occurring at 90 deg to the wrist pin centerline. As a result, the wear pattern is definitely crescent shaped on opposing faces. Tolerance of 0.006 and 0.007 in. are allowed at this point and must be maintained. One road has developed a process of reclamation which has proven successful in service. The procedure is as follows: A thorough degreasing is followed by a second treatment prior to metallizing if any appreciable time elapses. Surfaces to be metallized are then prepared by a rough filing and application of an oxy-acetylene flame to establish a preheat temperature of 250 deg F. Sprabond metal wire is applied to a deposit thickness of 0.012 in. to 0.015 in. on a side. Sprayed carriers are then mounted in a jig to establish absolute centering and alignment. Old style carrier reclamation costs 30 per cent of new while the new style reclamation costs 20 per cent of new.

Brush Holder Lever and Shunt Assembly. The lever and shunt assembly of the EMD generator brush holder is not expensive as a unit, but 24, 36 or 48 are used depending on generator type. Lever and shunt assembly wear is confined to shunt raveling or abrasion, and to burn or wear of the brush bearing pad. Shunts are readily replaced as a routine matter. Levers are usually scrapped when the bearing pad is damaged. In reclaiming, the remainder of the pad is ground off. A replacement pad, $\frac{3}{8}$ in. square is punched from 12 gauge copper. A jig designed to hold both the lever and the pad in proper relationship is provided and the joint is oxy-acetylene brazed. A cleaning process using ordinary plating shop baths is given to the levers but cleaning can be confined to wire brushing only. Reclamation cost is about 15 per cent of new.

Spacer Rings for Timken Bearings. Proper operation and service life of Timken bearings is obtainable only if maintenance is given the attention it merits. More wear accumulates on the spacer ring than on any other bearing part. A method of restoring size to these spacer rings has been developed in which ring halves are nested in a jig and the deposits of aluminum bronze is applied to one face by the metallic inert gas process while the work is rotated in a positioner. This method produces no distortion. After welding, the halves are separated and ground to proper dimension while held on a magnetic chuck on a surface grinder. The routine costs about 40 per cent of a new ring. The units can be bronze welded using the oxy-acetylene process and a manganese bronze welding rod. However, these methods tend to distort and an increased labor charge makes them less suitable.

Hard Coating of Pistons. One railroad is experimenting with the hard coating of Baldwin-Lima-Hamilton and Alco 539 aluminum pistons which have been on test for approximately 10 months with no failure. This hard coating does not readily adhere to parent metal ring carriers or cast aluminum pistons due to the high silicon content. However, it readily adheres to reclaimed aluminum pistons welded with 43S aluminum welding wire. After welding, the pistons are sent to an outside shop for the hard coating.

Alumilite Hard Coatings. These Alumilite hard coatings are a series of wear- and corrosion-resistant finishes that can be applied to aluminum alloys. They are produced by electrolytic oxidation in a special acid solution, operated at low temperature using high dc current densities. Alumilite 226 and 726 are applied to wrought and cast alloys respectively. This produces a 0.001 in. thick coating of which 0.0005

in. is penetration. For close tolerance work the build up of these materials can be controlled within the 0.0002 to 0.0006 in. range. For milder applications where the corrosion and wear is less severe, the 225 and 725 coatings are sometimes used. For best wear and corrosion resistance, these coatings should be applied to aluminum alloys with low copper and silicon content.

The Alumilite type 226 coating on 61S and 75S wrought alloys has withstood 3500 hr salt spray exposure without signs of failure. The same coating applied on 24ST aluminum test panels have completed over 1500 hr of salt spray exposure without failure. For rubbing type of abrasion, the 226 coating on recommended alloys is comparable to mild case hardened steel. However, its use is limited to applications where the core hardness of steel is not needed. The high dielectric strength exhibited by these coatings make them valuable in preventing galvanic corrosion when aluminum is used in contact with dissimilar metals. It is also valuable for applications where a non-conductive coating is required. They are somewhat brittle which necessitates reasonable care in handling and packing.

These coatings should be considered for any applications where wear or corrosion resistance is needed on aluminum parts. The coating has the ability to retain a fluid on the surface, if this surface is needed to retain a lubricant. The dielectric properties can be of value in electrical applications as well as in resisting galvanic action. Hard coating should be considered as a competitor for chromium plating on aluminum. Its corrosion resistance is far superior to chromium plating and is competitive in wear resistance, while the cost is only a fraction of chromium plating.

Reconditioning by Metallizing. Improved maintenance programs for increased service life resulting in decreased mileage cost of diesel-electrical equipment remains a constant concern for all railroads. The most common parts which become defective by mechanical wear of bearings are armature shafts of generators and motors. Though the metallizing procedure is not difficult, it can best be described as given below:

Preparation: True up worn surfaces on centers by one or more rough cuts in a lathe. Remove at least 0.025 in. of metal on the radius and produce a corrugated surface of approximately 36 to 48 cuts per inch. Thus prepared surface must not be touched or contaminated in any fashion.

Metallizing: Using ⅛ in. Sprabond wire, correct air and oxy-acetylene pressures, lighted 4-E gun. With the wire not feeding, pass the flame rapidly over the surface to warm it, about 1 min. Immediately after warming, adjust the wire to feed. Adjust and apply one pass over the surface to approximately 0.002 in. depth and close gun valve. Then change wire to ⅛ in. gauge, high-chrome medium carbon stainless steel, applying multiple passes to a dimension approximately 0.020 in. over finish. The work should rotate at a surface speed of approximately 50 lineal feet per min.

Inspection: After the surface is sufficiently air cooled, use a light test hammer to test for soundness. Grinding also produces an adequate bond strength test.

Finishing: Remove the work to a grinder and finish to desired specifications. High chromium-medium carbon stainless steel wire may be machined with grade 883 Carboloy or equal cutting tools. On a cost basis, savings realized through metallizing will vary on different parts. A conservative average savings will be 90 per cent of the cost of a new part.

Fuel Injectors and Pumps

The basic consideration in all maintenance operations is to obtain in a given period of time the optimum performance from equipment at an optimum cost. Reasonable economies to be expected from a positive injection overhaul program are as follows for a typical fleet of 180 locomotives. Where the shopping program is based on a 24-month interval, an extension of 3 months per locomotive is equivalent to eliminating the shopping time for 6.25 units. A 1500 hp locomotive unit operating an average of 10,000 miles per month, at normal tonnage ratings, will consume 2.02 gal of fuel per mile. A saving of 1 oz per gal over present consumption would amount to 188 gal per yr per unit, or 18,800 gal.

With properly overhauled injection apparatus, a marked reduction in lube oil dilution will be obtained. A reduction of one dilution per unit per year is a saving of 180 gal per unit or 18,000 gal. In addition to the economies mentioned, other benefits which cannot be calculated will accrue such as reduction in train delays, reduction in engine delays, extended in-service life of injection apparatus, standardization of fuel injection apparatus, reduction of inventory of spare components, quicker turnover time in shop and installation of compatible injection equipment on specific engines.

An important item in parts reclamation is shipping containers. Any savings realized will be lost if care is not exercised in handling of reclaimed parts. Selection of container material is made on several bases: amount of protection required, moisture proofness, strength of container, resistance to grease, fire resistant, long service life and ability to absorb shock. It is felt that much is to be gained by increasing the use of properly designed containers.

Discussion

Q. Has anything been devised about normalizing a crankcase on vital areas that have been welded?

A. When you normalize a crankcase, you naturally change dimensions in every direction. There is no single portion of that crankcase that can come back with the original surface, because the stresses of service have built up a certain amount of strain in the case that is relieved by a normalizing procedure. You can get away with localized stress relief; you cannot get away with localized normalizing, because you're taking the metal past the critical point. That has been our experience with crankcases.

Visual Aids Fit Today's Training Needs

The saying "I'm from Missouri, show me" may appear to be entirely out of place in this modern age, yet the phrase takes on a new meaning when it is used to remind us of the importance of visual aids in training maintenance personnel. The subject was studied by a special LMOA committee.

Human Engineering: Our jobs as mechanical supervisors are to create economical operations by the use of such facilities as may be available and must be directed towards successful utilization of the most creative methods of training personnel, according to the committee. Every individual saddled with the responsibility that goes with supervisory positions daily utilizes various types of visual aids in directing employees engaged in maintenance operations.

Skilled Workers: The primary objective of training personnel is to develop skilled employees of the several classes required for economical maintenance of mechanical equipment. Most workers obtain and absorb their know-how in

two specific ways: first, by usually watching some other worker who may not have had the proper training; and second, by studying blue prints, catalogs, folders, etc., relating to the task.

Looking Ahead: Utilizing visual aids to convey information enables average personnel to gain and absorb, in a given time, at least 35 per cent more factual details of a complex mechanism. Of more importance, is the ability of personnel to retain a much greater percentage of such information when compared to traditional or ordinary methods of instruction.

What Should Be Used?

To a marked degree the training of personnel is by oral instruction, which alone is not the most effective method. Spoken words are in simple terms just the names we give to our own ideas and experiences. A sketchy bit of verbal instruction coupled with a handful of blueprints will seldom convey a full understanding. On the other hand, the use of a visual aid will generally bring about the desired result. When properly designed and used, it will definitely pave the way to greater effectiveness in training.

Chalk Talks: The most frequently used visual aid is probably a piece of chalk, a clean spot on the floor, the side of a car or a flat sheet of metal. This simple chalkboard becomes a most effective aid in giving instructions. The following ideas will enable you to enhance its value and effectiveness: Clean and erase all unrelated markings. A chalkboard cluttered with unrelated data will not entice the worker to take a second look for absorption of details. Use chrome yellow and pale green chalk because they are far more effective than plain white. Simple illustrations made with colored chalk will be more readily remembered.

Bulletin Boards: Another device which may be used effectively as a visual aid to convey appropriate information is the bulletin board. Cartoons are a unique pictorial method which has long been effective and is useful in pointing out safe practices. Actual pictures of specific conditions are also excellent in putting across an idea in a fleeting glance.

Models: Cut-aways are generally considered to be very effective training aids because they are interest-arousing gadgets that bring into play all of the senses. These models should be carefully prepared to enable effective training. They should show minute working details and, should be painted in color dynamics to focus attention to vital parts in order to develop the desired know-how skill of personnel assigned to maintenance jobs.

Motion Pictures: The 16-mm movie camera, or other sizes, especially those with sound track arrangement, present realistic media for presentation of correct methods of performing countless operations. In making a film, these suggestions may be of value: Determine the precise purpose which you desire to convey; do not attempt trick photography; begin with a familiar subject then proceed to the more difficult problems; make use of cut-away models since they can be moved to simulate operation. There is one basic principle that must not be overlooked in using film as a visual aid. Remember that the personnel are spectators and that they are some distance from the real thing. If just one employee can absorb sufficient know-how to prevent a serious injury or extensive damage to equipment, the effort and cost of the film will be repaid in full.

How Is It Done?

The several types of visual aids mentioned are just a few of the adaptations that may be utilized for effective training. One type of aid used successfully by one supervisor may be a complete flop with another. However, there is no limit to individual ingenuity in devising and utilizing visual aids designed to fit particular situations and conditions. Other factors to be considered are:

Personality: As you give thought to overhauling your present training methods, keep uppermost in mind that no device can displace the rich personality and friendliness displayed by every supervisor when giving instruction. It is well to remember that you are dealing with individuals, who are mainly independent in their thinking and, no doubt you will find it rather difficult to shake some antiquated ideas out of their heads.

Desire: The lack of know-how is a disturbing factor in locomotive maintenance problems and the training methods in use on most railroads need to be overhauled. Attitude and desire to learn are of paramount importance and, due to varied circumstances, no clearly defined or single process has been developed for getting across ideas.

Enthusiasm: It would have been a difficult and far reaching undertaking to attempt to evaluate individually the varied types of visual aids which may be used effectively for training personnel. Railroads are obliged to compete with other industries in obtaining suitable personnel and, in this highly competitive era, it is of utmost importance that appropriate methods of training be introduced.

R.F.T.E.A.

Slack Control Is Train Handling Key

"If slack must be taken, take it on the entire train." With this rule on train starting, a committee on train handling of the Railway Fuel and Traveling Engineers Association began a detailed study of bunching and handling slack on today's long trains in order to prevent damage to equipment and lading. According to this committee, "Nothing will lose a railroad good will faster than poor train handling either in freight or passenger service." Train radio was mentioned as an almost indispensable tool in many of today's situations.

Taking slack on trains on ascending grades is complicated. If helpers are used, these locomotives should take the slack. Without a helper, the first step must be a brake pipe reduction which is great enough not only to prevent movement of the rear end, but also large enough to insure subsequent release of all the brakes. The locomotive should then shove the slack in on the entire train after sufficient brakes have been released to make this possible. With radio available, the engineman should inform the conductor he is taking slack, and the conductor should report whether the caboose has moved back and how far. Before starting, the engineman should be informed when brake pipe pressure at the caboose has been restored to a value just below that which would release the rear end brakes. One road provides trainmen with "walkie-talkies" and requires them to inform the engineman when brakes fifteen cars ahead of the caboose are releasing. Without radio, it is necessary for the engineman to estimate the timing so his start will be made before the rear brakes release. Of particular concern to enginemen is the location of slack in a train stopped by another engineman, or in a train which has just been made up.

A method of stopping a train on a heavy ascending grade with the aim of permitting easy starting is to close the throttle slowly a notch at a time while

drifting to a very low speed and allowing the slack to close in, if possible. Use the engine brake lightly, and then apply the train brakes with a six or seven psi reduction, with the train line service exhaust open, and with the locomotive brake fully applied forty feet before stop is completed. The committee recommended that stops on ascending grades be made with as light an automatic brake application as possible.

To start a train on a descending grade when slack has been stretched while stopping, move the locomotive three to five feet at a time and then apply the locomotive brake. This should be repeated until the train moves down against the locomotive.

Listed in order of increasing handling difficulty are the various train consists with which an engineman may be confronted:

- All loads or all empties.
- Mixed loads and empties equally distributed.
- Heavy loads at front and light loads at rear.
- Loads at front and empties at rear.
- Empties at front and loads at rear.

From a train handling standpoint it is essential that the engineman know exactly how his train is made up. Good control of slack during slow downs while braking, and while moving the train through sags and over knolls without the use of brakes is the mark of a skillful engineer. The members of the committee agreed that over sections of line with closely spaced knolls, radio communication between the locomotive and caboose is doing more toward solving the problems of undesired slack action than any other single thing.

Because of the relatively low tractive effort of diesel locomotives at high speeds, it may be impossible to run away from slack run-in. This can be especially true when the rear of a train is on a descending grade. The speed of the front of the train must then be controlled to avoid harsh run-out of slack—by reducing the throttle. It may even be necessary to brake the train and approach these districts at reduced speed. Using either the closed or stretched slack methods, the committee emphasized that handling recommendations referred to line profiles where the train was on two or more sags at the same time. Attention must be given to choice of methods which will not result in slower train operation.

In slowing a train of less than 100 cars, either all loads or all empties, the stretched slack method is recommended, if speed is not less than 30 mph. The independent brake should not be used and power should not be reduced on the locomotive. A brake pipe reduction of 8 psi should be made. This is necessary to insure a release. A greater brake pipe reduction could prevent stretching slack. Trains of 101 to 125 cars at speeds not less than 40 mph should be handled the same way except that the total brake pipe reduction should be not less than 10 psi. A reduction of 10 psi with initial speed not less than 50 mph should be used for stretched-slace handling of 126 to 140 car trains. The speed at which running release is made will depend upon the locomotive tractive effort, the length of train, profile, and brake pipe leakage. No running release should be attempted if leakage has increased the brake pipe reduction on 140 car trains to 15 psi.

For trains of over 100 cars with most of the loads at the rear, the closed-slace method of slowing should be used. Reduce the throttle a notch at a time to *RUN 1*, allowing slack to run in by itself before the train brakes are applied. Make a reduction of 6 to 7 psi and let the brake pipe exhaust close before making any further reductions if needed. Each additional reduction should be 2 psi. Do not use the independent brake. Release of trains up to 100 cars should be made at not less than 20 mph, 101 to 125 car trains at not less than 25 mph, 126 to 140 car trains at not less than 30 mph. If leakage has brought total reduction to 15 psi, a running release should not be attempted. If speed is less than 40 mph when making the release, reduce the throttle to idle. If speed is below 35 mph, an independent application of 25 psi should be made before the automatic valve is moved to the *RELEASE* position. The independent brake should be kept applied until train brakes have had time to release, and then it should be released in 4 psi graduations.

Stopping trains of over 140 cars of any make-up or shorter trains with loads at rear should be done by reducing throttle to *RUN 1*, and by starting applications early enough so that brake cylinder pressures will preferably not exceed 12 psi. The total brake pipe reduction should not be less than 15 psi, and no attempt should be made to make a running release. Brake pipe pressure should not be reduced below the equalizing point before the stop is completed. For 70 psi brake pipe pressure this equalizing point is 50 psi, for 80 psi it is 58 psi, and for 90 psi it is 66 psi. Sand should be used during the last eight car lengths before stopping. The throttle should be in *IDle* and the automatic brake valve train line exhaust should be open 100 ft before the stop. The independent brake should be used during the last 40 ft. It should be fully applied or adjusted so that wheels do not slide.

Trains of 140 cars or less composed of all loads, all empties, mixed loads and empties, or loads at front and empties at rear should be braked with throttle remaining in *RUN 8*. A 6 or 7 psi reduction is usually sufficient, but if additional reductions are necessary they should be of 2 psi each. Reductions made while train is operating at higher speeds should determine braking characteristics. The throttle should be reduced as speed drops, finally closing the throttle and applying locomotive brakes as described above. Stopping trains of any type from 12 mph or less, the throttle should be closed, trains should drift to lower speed, slack should be bunched with the independent air before applying the train brakes. Brake pipe service exhaust port should be allowed to remain open until the stop is complete.

Flat maintaining is an aid which permits running release of much longer trains and allows much better slack control. Discussion gave additional support to the use of pressure maintaining.

R. H. Francis, general road foreman of equipment, Frisco, who read the paper said that several years of observations and impact recording had revealed no on-the-road impacts greater than 4 mph. He stressed the importance of better train handling in yards to reduce loss and damage. This opinion was confirmed by E. P. Olson, Frisco's assistant to the operating vice president, who reported that 70 to 80 per cent of the overspeed impacts on the Frisco occurred in yards. Olson reported that damage is up in the first six months of 1956. This damage means loss of customers—and railroads cannot stand to lose customers.

Impact reduction must be accomplished by convincing emloyees of management's determination to eliminate damage to lading. An effective method on the Frisco was to produce direct employee participation by assigning engineman and switchmen to temporary duty as supervisors of loss and damage prevention.

Economy Fuels Pose Many Problems

"The use of economy fuel has enabled all of us to surrender to the very American failing of wanting to

tinker with our mechanical appliances," stated L. S. Crane, Southern's mechanical research engineer, during a panel discussion on the use of economy fuels before the Railway Fuel and Traveling Engineers Association. Other panel members were V. C. Barth, assistant engineer of tests, Chicago & North Western; W. K. Simpson, technical director—fuels and lubricants, Electro-Motive; and L. E. Talbot, chief chemist, Texas & Pacific.

The same opinion had previously been expressed by Mr. Simpson in discussing a question concerning engine changes necessary to burn fuels which ignite more slowly than straight-run distillates for which all locomotive diesels were originally designed. It had earlier been brought out that the discussion was centered mainly around catalytic-cracked distillates and not residuals. A characteristic of these fuels is lower API gravity—more pounds per gallon. A result of this is more BTU's per gallon—a figure which can run up to four per cent. Any such fuel, properly burned, could increase engine output unless the power piston, is cut back. If an engine is operating near its maximum designed output with little inherent factor of safety, increased horsepower using a different fuel could cause serious mechanical difficulties.

A power piston change from 11/32-in. to 3/8-in. has been made on 1500-hp engines when different fuels were used which could have raised maximum output by about 45 hp. The simplest way of changing engine timing is at the injector, but Mr. Simpson warned about the complications of having two types of injectors in use. An even more complicated solution is moving the timing gear which, it was pointed out, not only changes the timing of injection, but also the timing of opening and closing the exhaust valves. In intermediate ranges these changes might be beneficial, but at high outputs they are not. The EMD spokesman recommended that timing changes should not be made when using economy fuels.

What Is Economy Fuel?

The Chicago & North Western, according to Mr. Barth, has changed timing of Electro-Motive engines. Engines in 80 units had the cams advanced 5 deg and the injectors 4 deg. At the same time the power piston was moved from 11/32-in. to 13/32-in. This cleared a smoking condition, but Mr. Barth backed Mr. Simpson on his recommendations about engine timing changes. Fairbanks Morse experimented with low grade fuels in a laboratory engine for the C&NW and could find no advantages in changing timing.

From a series of definitions, Mr. Talbot cited as the best, one given by W. T. Robinson of DuPont, "An economy grade fuel is any diesel fuel that is less expensive to use than a standard quality fuel." This combines lower purchase price with no increase in operating costs and, according to the speaker, defines the lower cetane, catalytic-cracked distillates received today.

Mr. Barth said the fuels under discussion are slower in igniting than straight-run distillates, and consequently there will be more unburned fuel in the combustion chambers at peak pressures. This can be followed by afterburning, and even may result in raw fuel coming from the stack of a cold engine. Raw fuel can also wash the lubricant from the top-ring region, and carry soot and and dirt into the crankcase. Another characteristic of these fuels is higher sulfur which finally can cause corrosive wear and destroy the effectiveness of the lube oil additives—increasing build-up of varnish and lacquers.

Mr. Crane described the role of additives by explaining that one of the principal characteristics of lower grade fuels is the growth of asphaltic substances during storage. These can plug injectors and cause deposits throughout the fuel system. Dispersing these formations is one additive function. Cetane improvers (analogous to tetraethyl of lead in gasoline) have been used but are expensive and not widely accepted in the railroad industry. Another additive slows the crystallizing of paraffins tive slows the crystallizing of parafines in oil and makes them easier to handle at lower temperatures. Heating can do the same job. Sulfur-dispersing additives have not been too effective according to Mr. Crane and a more immediate solution is the chrome plating of combustion area components exposed to the burning of high-sulfur fuels.

What About Propane?

Propane as a diesel fuel was suggested, and Mr. Simpson confirmed that this has been an active subject with EMD because of the price, availability, and because it is clean burning. Its principal handicaps are safety hazards, and the fact that the diesel will burn it effectively only if it develops about 75 per cent of its original rated power. If the original high compression ratio is maintained, there will be detonation. In stationary service at continuous full load, diesels have operated 10,000 hours with no engine deposits and no dirt in the lubricating oil. These were not exposed to the constantly varying throttle operation inherent in railroad service and Mr. Simpson indicated that no builder had a satisfactory fuel control system for propane in locomotive-type service.

Lack of stability—formation of asphaltic deposits—can be the result of light, time and/or heat according to Mr. Talbot. The Texas & Pacific uses a heat-stability test for approving their diesel fuels. Reasoning is that fuels are not exposed to light at any time, and the T&P operates with no more than a 30-day supply of fuel oil. A survey was cited which indicated that of 15 roads, five used no stability test. Of the other ten, one uses an extended storage test; two use a light stability test; one uses a combination of light and heat stability testing; and all the remainder use some variation of the heat stability test.

Questioned about operational correlation with the T&P test, Mr. Talbot indicated that seven of eight suppliers could provide fuels meeting the heat stability test. The eighth fuel did not pass, and in actual use caused injector trouble and filter stoppage. Mr. Crane said that fuels which might be stored for several months should be subjected to severe stability testing.

How Much Ring Wear?

Ring wear with economy fuels has been principally a function of sulfur according to Mr. Barth. He cited a CRC test on seven railroads using fuels with one per cent sulfur. Results showed that apparently the composition of the fuel in addition to its sulfur content played a part in ring wear. The aromatic content apparently had a role. Successful Southern Pacific experience in burning fuels with 2.5 per cent sulfur was mentioned. Keys to this SP operation according to the speaker were keeping engine temperature up to promote complete combustion, and idling as little as possible.

Cetane, an often-cited characteristic of economy fuels, has been over-emphasized according to Mr. Simpson, and he stated "Diesel engines, not only our own (EMD) but other competitive engines, are far less sensitive to cetane number than most people would imagine." If a fuel is offered, its pour and boiling range should be considered ahead of cetane. Cetane rating may frequently be correlated with other detrimental characteristics which actually have a much greater effect on poor engine operation.

The overall picture which must be studied when economy fuels are utilized on railroads was discussed by Mr. Crane while pointing out who should be responsible for a decision to use econ-

omy fuels. His answer: the operating vice president.

This officer is charged with bringing the greatest amount down to net, and savings which may be made in purchasing economy diesel fuels must be balanced against the extra expense which may be incurred in engine maintenance, supplementary fueling facilities, and special appliances on the locomotive and engine. It was summarized with "the decision as to whether you are going to burn an economy diesel fuel or not has to be made at the top level of your company's management by the man in that management who is responsible for the operation of the railroad."

The Car Department's Job

(Continued from Page 65)

chunk of the industry's annual operating budget. The expense of maintaining freight and passenger cars in 1955 amounted to 727 million dollars or about 7 per cent of the operating revenues, more than over 10 per cent of the operating expenses and in excess of 50 per cent of the maintenance of equipment expenditures. In addition you are dealing with the basic "containers" used for the transportation of goods and people.

You in the Car Department still are faced with some puzzling problems, not the least of which is that of broken wheels. . . You have other problems to which you are giving a lot of attention and on which you are making considerable progress. For example, the hot box problem, which is yet unsolved. The draft gear is another vital part of the railway car demanding attention. Gears which were designed for a coupling speed of 4 miles an hour do not match the needs of our present day operations, and one of the weaknesses which shows up as a result of this inadequacy is in the bolsters. Research of the past few years has done a great deal to inform you how some of the present running gear behaves, and what causes the trouble, giving you opportunity to take corrective measures. This research has been carried on by individual lines, by the Association of American Railroads and, to a large extent, by equipment manufacturers. I am sure you will not run out of work for quite a little while in continuing this research and developing better designs of cars to overcome present difficulties.

You have another problem—a difficult one—which has to do with the superstructure of the car. This part of the car, you might say, belongs to our customers. Efforts have been made within recent years to determine what the customer really wants in railway equipment. This sounds simple, but any of you who have wrestled with and sweated over questionnaires know there are about as many ideas on the subject of rail equipment as there are customers—perhaps more. I believe, however, that our inquiry into this subject has been productive in determining what features to put on the superstructure of cars for the greatest good for the greatest number of patrons.

In approaching this problem of car design you, of course, have to balance first cost against the continuing charges for maintaining the car and then persuade your boss to dig up enough money to enable you to design and build the car you want. You have the additional problem of adapting the present fleet of cars to present day operation.

Since there is very little traffic that stays on one railway there is the often-puzzling problem of building your ideas into a car with consideration of its suitability for use in interchange movements. I am sure that you have all run head on into this question on more than one occasion.

Since a very large part of freight handling involves more than one line, it is extremely difficult—factually, almost impossible—to keep cars on their home lines. This varies, of course, with the various types of equipment, but I feel it can be said truthfully that the railway industry is suffering seriously from the shameful habit of keeping cars away from their home roads.

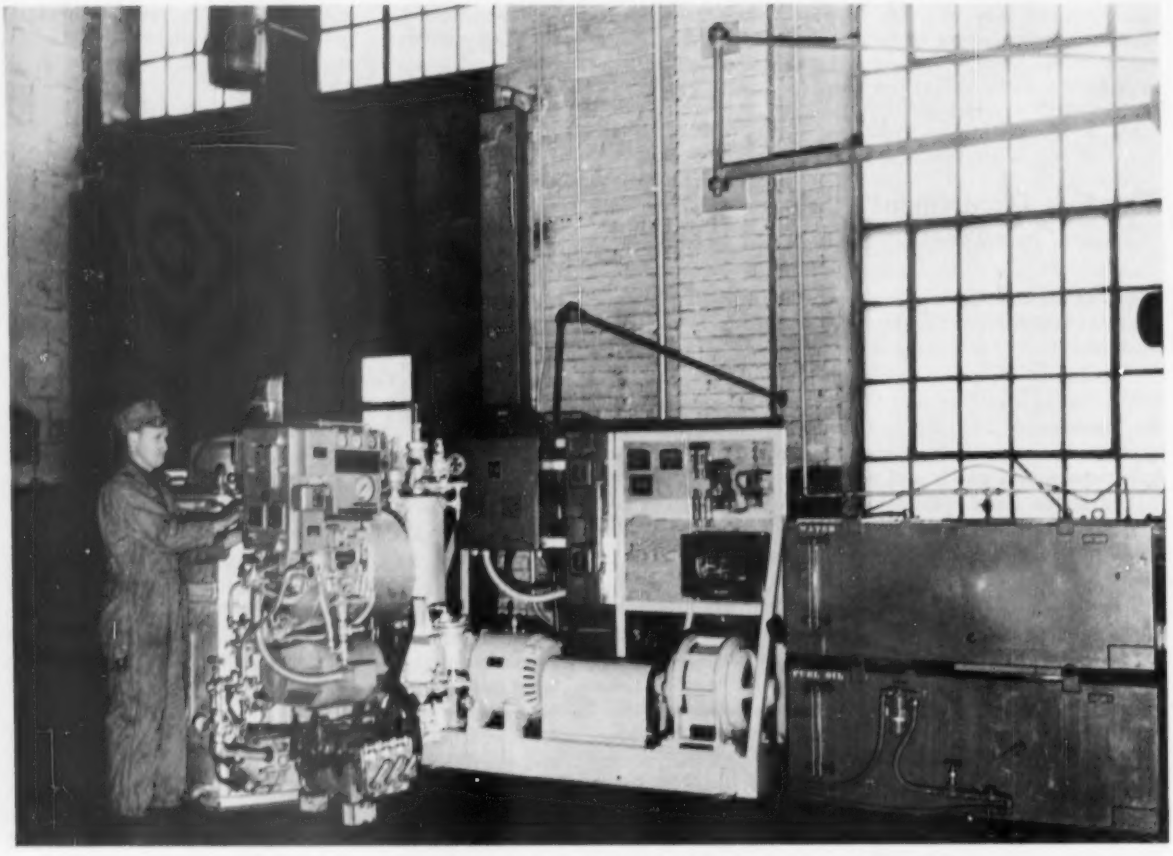
Passenger cars are not subject to enforced wanderlust. For the most part, they are stay-at-homes. The passenger car, however, has ceased to be a simple box set on wheels with seats inside. They now are complicated, delicate pieces of machinery which will perform beautifully when properly cared for. They are temperamental and, all too frequently, fail to function properly, especially when performance is of utmost importance.

So you find yourselves with plenty of work in prospect and many problems to be solved. Since you are dealing with the basic "containers" used for transportation you are somewhat in the limelight because the customers see and know cars better than they do other facilities and often are highly critical of the condition of the cars furnished for their use.

"Safety Is No Accident"

(Continued from Page 65)

The failure of the railroads to police their own organizations was responsible for the high accident rate resulting from unregulated locomotive condition and for the ultimate enactment of the law which protects employees and travelers . . . It is axiomatic that a well maintained locomotive is economical in operation, reliable and, above all, safe to use for its intended purpose . . . Effective inspection is the foundation of trouble-free locomotive operation . . . Today, locomotives are more heavily loaded and more intensively used than ever before . . . The need for inspection is greater than ever before. Compliance with inspection rules is not only in the public interest, but is also smart railroading . . . "Safety is no accident" . . . Experience has been that railroads with the best safety records are those with good inspection procedures, followed by correspondingly adequate repair and maintenance standards.



A Vapor steam generator being tested in the Mississippi Street shops of the Northern Pacific.

Steam Generators Put Through Paces

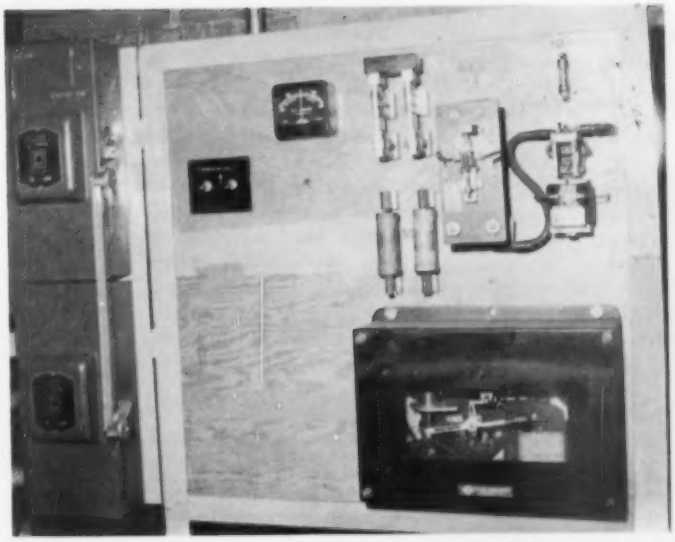
BY MEANS OF A TEST RACK developed in the Mississippi Street shops at St. Paul, Minn., the Northern Pacific puts steam generators through performance cycles before they are placed on the locomotive. The rack is suitable for testing both Elesco and Vapor generators. It consists basically of a 15-hp, 3-phase, 220-volt a-c motor, driving a 10-kw, 80-volt Delco d-c generator, an Allis Chalmers voltage regulator, a battery in the generator circuit and two 250-gal tanks, one for water and one for fuel oil.

Two toggle switches at the left of the control panel are used to control the voltage regulator and the voltage is normally set at 74 volts. A reverse current relay prevents the battery from discharging into the generator and a 0-200 ammeter shows the amount of forward current reading, and also reverse current. There is an Elesco control panel on the test rack which is used when Elesco generators are under test. When Vapor generators are under test, they are controlled by the control panel which is mounted on the generator.

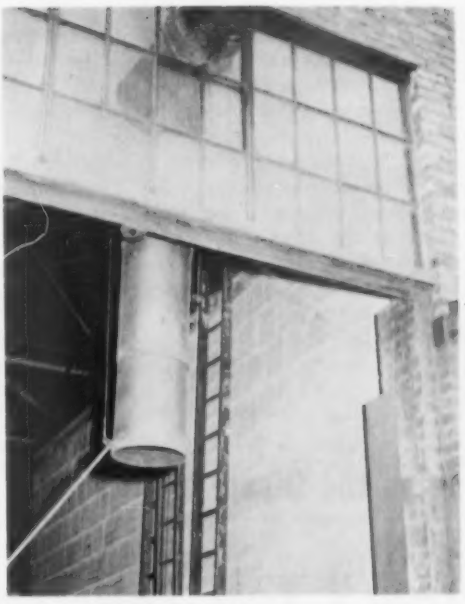
The motor-generator is started and stopped from two pushbutton stations, one located at the mounting site and the other in the electric shop.

The connections for operating steam generators under test are made through an Elesco motor control panel. Two 100 ampere switches are used in tandem for feeding the panel and are mounted so that when one is open the other is closed. A voltage of 69-70 volts is used.

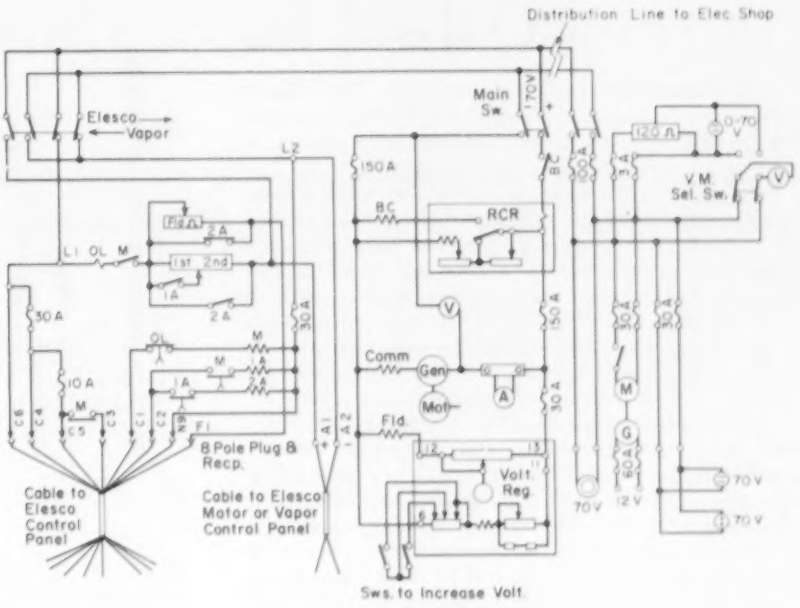
Terminals *A1* and *A2* are fed directly for Vapor steam generator operation, when switches are in the *UP* position. The cables from *A1* and *A2* are connected to the control



The control panel on the test rack. The bar connecting the switches at the left insures that one is open when the other is closed,—the lower switch is mounted upside down.



The telescoping stack is lowered over the generator stack opening when the generator is under test. (Upper right.)



Wiring diagram for the test rack including circuits in the electric shop.

panel, which is already mounted on the steam generator under test.

Terminals *L1* and *L2* are fed for Elesco steam generator operation, when the switches are in the *DOWN* position. The cables from *A1* and *A2* terminals are connected to the circulating pump motor mounted on the generator being tested. The remainder of the terminals are connected to an eight-pole receptacle. An eight-conductor cable and plug assembly is plugged into the receptacle and the other end is connected to the respective terminals on the control panel, which is mounted on the steam generator, except for *F1*, which is connected to the field of the circulating pump motor.

The 70-volt power from the test rack generator is used to operate the motor which drives the blower, the fuel pump, the water pump, the motor-generator for ignition, the blow down valve, the fuel solenoid valve, low water alarm valve, steam temperature limit control, the micro switch on the servo control, the air switch, the outfire relay and alarm system, the stack switch and lights.

In making a test, the generator is first put on high fire manually while checks are made for stack temperature and motor speeds with 70 volts at the motor. Next the metering valve on the water pump is opened and the servo lowered to low fire position. Checks are then made of return water and stack temperatures. This is followed by holding 200 lb pressure on the separator with a 1¼-in. orifice at all fires. Then the metering valve on the water pump setting the servo on intermediate fire, checking return water and stack temperatures again. The final

operation consists of shutting off the metering valve on the water pump and rechecking the performance of the generator on high fire.

When a generator is under test, it is placed just inside one of the large doors of the shops and piped to atmosphere. A telescoping stack is run through the window above the door as shown in one of the illustrations and the counterweighted lower section is pulled down over the stack opening of the generator. After the tests are completed, the generator is placed on a locomotive, and it is then only necessary to fire the unit and look for any possible steam or water leaks.

When tested in this way, all parts of the generators are readily accessible for thorough testing and the making of adjustments. The procedure eliminates the need for doing work on the locomotive and saves locomotive time. Experience has proved it reduces road failures.

The output of the motor-generator set is also run to the electric shop, as indicated on the diagram where it serves several purposes. The circuit is the same as an *F3* charging circuit except for the two switches which are connected in parallel with sections of the voltage regulator adjusting resistor. These two switches make it possible to have three different voltage settings. The distribution panel located in the electric shop has four fused circuits: 70-volt, 100-amp; 70-volt, 30-amp; 0- to 70-volt, 3-amp and a 30-amp circuit to run a headlight dynamotor for a 12-volt, 60-amp supply.

From the Diesel Maintainer's Note Book

Don't Test Your Luck

By Gordon Taylor

Carelessness has long been considered Diesel Enemy No. 2, and is strongly competing with *Dirt* for first place as Diesel Enemy No. 1. The following is an account of one of his most recent accomplishments.

A four-unit EMD diesel locomotive with a full tonnage train suddenly had one unit shut down for lack of fuel. A hasty check-up revealed that the fuel pump motor fuse had blown. A new fuse was applied and it quickly blew because of a defective motor. It was then necessary to reduce tonnage and proceed to the nearest terminal where a new motor could be installed. An examination of the defective motor quickly revealed that Carelessness had been responsible for the defect and failure.

If you will examine an EMD fuel pump motor, you will find it is mounted on a sheet steel base, which is secured to the motor frame by four 5/8-in. fillister head cap screws. These screws are threaded into holes in the bottom of the motor field frame or housing. Some maintainer apparently found that the motor was loose on its mounting base and thought that he would remedy the matter by replacing the 5/8-in. cap screws with longer screws. What the maintainer should have done at that moment was to think before he used longer cap screws. He might well have wondered why the manufacturer did not use longer screws if they were really needed.

Diesel Enemy No. 2 seemed to take over at that point. The longer screws were installed with the result that the screws penetrated the interior of the field frame and passed into the field coil, where they badly grounded the coil, and created a partially open field circuit. The stage was all set for the failure which followed.

Had the maintainer had any care in his make-up, he still had the opportunity of detecting the trouble before he placed the motor in service. A careful and competent electrician always satisfies himself that a motor, a generator, or other device (with a current carrying circuit) is not grounded when the device is placed in service. It is not enough to simply know that a motor will run. He must know that it is free of grounds. A grounded device is one on which two strikes have been called. Another ground often produces a short circuit which will cause a failure.

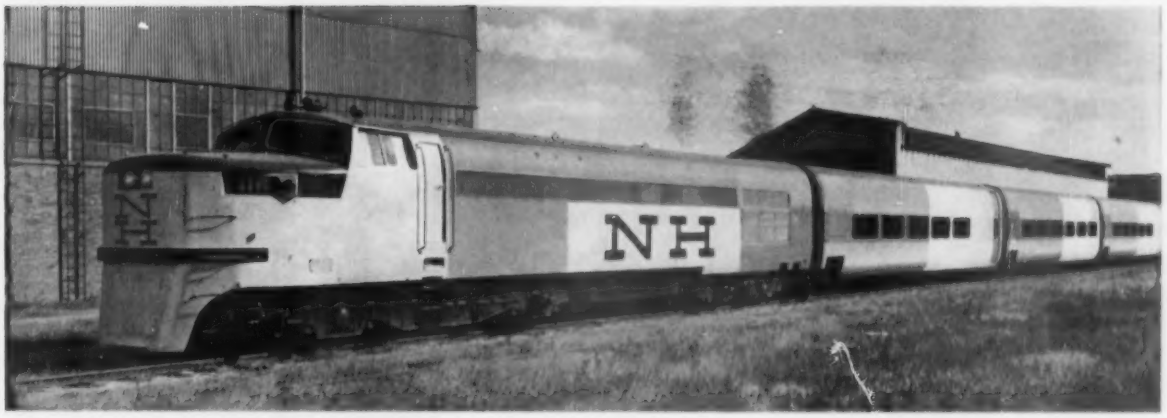
The Winner?

If you have been thinking as you read this note, you probably wondered as I did, why did the ground relay fail to detect the grounded condition when the engine was being started?

In seeking the answer to that question, I found that the ground relay was badly out of adjustment. It was another case of *Carelessness* taking over.

It is always necessary when repairing or installing any electrical device with current-carrying parts to be certain that it is not grounded to the frame of the device. That goes for contactors, switches, etc., as well as motors and generators. Any maintainer who fails to make this test is just testing his luck.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.



New Haven nine-car Train-X, "The Daniel Webster," has the aluminum construction and mechanical details which Pullman-Standard used in the train delivered to the New York Central. The NH train features new exterior and interior treatment. One Baldwin unit will be used at each end of the train.

New Haven Train-X Locomotives Merge
Diesel and Third Rail Operation

Two B-L-H units with Mec-hydro transmissions can be diesel-powered or electric-motor-driven from third rail for tunnel operation

THE TWO BALDWIN-LIMA-HAMILTON diesel Mec-hydro units built for the New Haven differ considerably from the locomotive now pulling the New York Central "Xplorer."* Overall dimensions, propulsion engine rating, and general arrangement are the same. However, the New Haven units are designed to operate into New York City's Grand Central Terminal with both the propulsion and auxiliary diesel shut down, and the power for traction and auxiliary equipment then coming from the 600-volt d-c third rail with which the terminal is equipped.

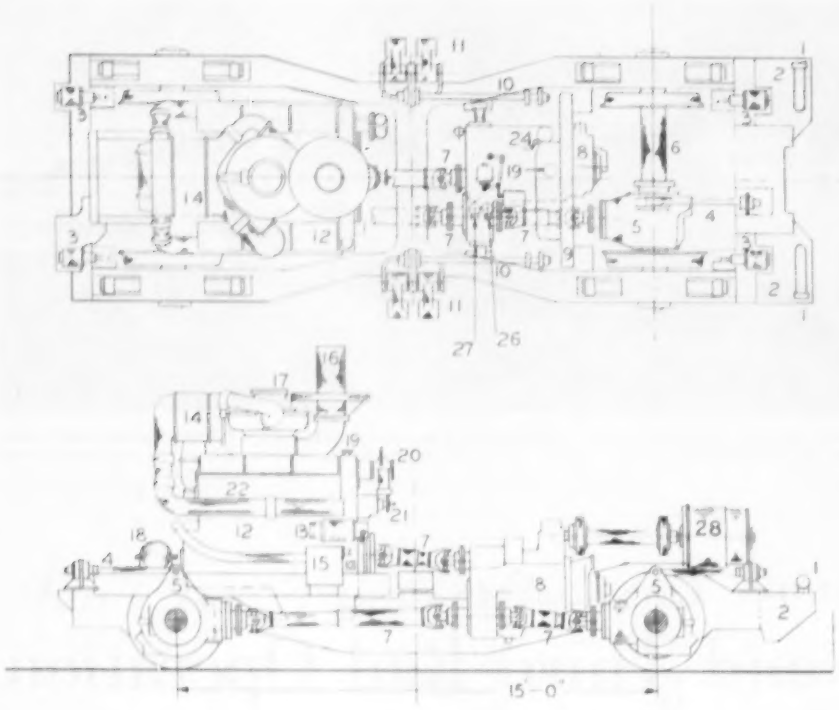
Summarizing the differences: Most important is the fact that both of these New Haven units will be hauling the single nine-car New Haven version of Pullman-Standard's Train-X. The two units will not, however, be coupled back to back as is typical for American diesel m-u operation. One of the units will be coupled at each end of the train, and the m-u controls for the trailing unit will then run through the 42-contact, Westinghouse Air Brake couplers used on the locomotive and Train-X cars. The propulsion truck for the New Haven locomotives is arranged like the New York Central truck, except that on its leading end transom are two General Electric 150-hp. d-c motors, both coupled to the Mec-hydro transmission. The idler truck at the rear of the unit has the New Haven's standard retractable third-rail shoe arrangement. Inside the unit, the auxiliary engine is a six-cylinder, in-line Maybach diesel, rated at 465 hp, and coupled to a General Electric 250-kw alternator. The NYC locomotive has a 570-hp, V-type diesel powering a 300-kw alternator. The new Haven alternator is also coupled to a 200-hp, Louis Allis d-c motor at the end opposite to that through which the auxiliary diesel drives. The engine room contains several additional control cabinets and a bank of resistors necessary to control third-rail power.

* Railway Locomotives and Cars, June, 1956, p 58

Power Truck

Because these New Haven locomotives are to use third rail power only while in Grand Central Terminal, and during the trip in and out through the three-mile tunnel approach to the station, only 300-hp in electric motors is provided on each unit. Maximum permissible speed in the tunnel is 35 mph, and for part of the distance, it is only 15 mph. A total of 600-hp was considered adequate for the train because of the moderate speeds involved in this operation.

Complicating the arrangement of the third rail equipment, is the provision made for changeover at speed. Above the throttle, on the locomotive control stand is a selector switch with two position—*ENGINE* and *MOTOR*. When the diesel is powering the train, this switch is in the *ENGINE* position, and the throttle provides eight



PROPULSION POWER TRUCK

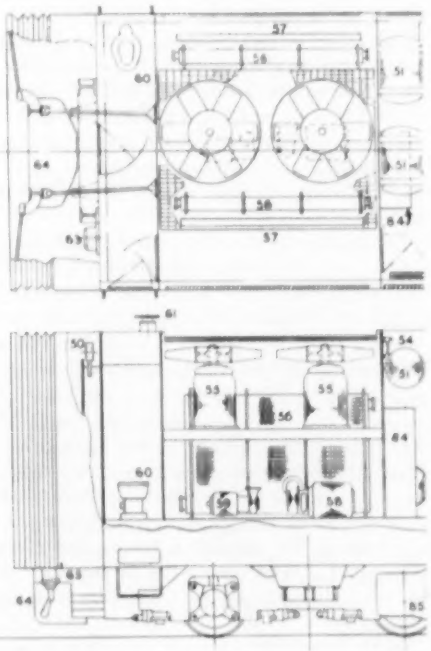
1—Sand fill
2—Sand box
3—Brake cylinder
4—Axle drive torque rod
5—Axle drive
6—Driving axle assembly
7—Drive shaft
8—Transmission (with disengaging clutch)
9—Transmission support
10—Torque rod (truck to locomotive body)
11—Swing links
12—Propulsion diesel engine
13—Starting motor
14—Supercharger intercooler
15—Electric junction box
16—Exhaust stack
17—Air intake
18—Heat exchanger—piston cooling oil
19—Lube oil filler
20—Fuel oil filter
21—Governor
22—Air intake header
23—Overspeed control
24—Oil level indicator
25—Oil fill—loading pad
26—Starting solenoid
27—Forward and reverse solenoids
28—Driving motors (3rd rail operation)

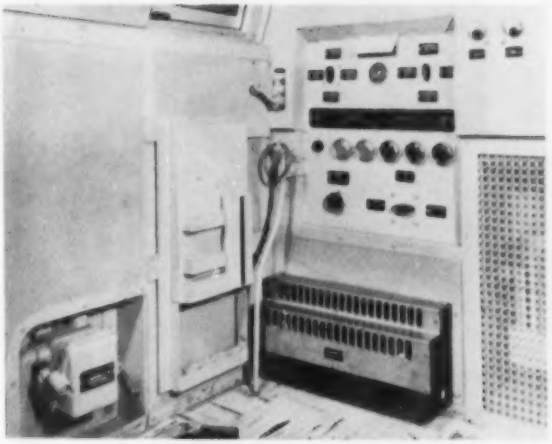
point control—*STOP, IDLE,* and 6 engine speeds from 600 to 1,500-rpm. To begin third rail operation, the first step is to lower the third rail shoes. The throttle is then moved to *IDLE;* the selector is moved to *MOTOR;* and after about five seconds, pilot lights indicate that the throttle can be opened to operate the locomotive with third-rail power.

The two GE traction motors on the power truck are of conventional railway series-motor design. They are bolted to the truck frame and are coupled to two flanges located at the top of the standard Mec-hydro transmission unit. These two flanges are blanked off on the NYC locomotive, but the flanges are used in Germany for auxiliary power take-off. Such auxiliaries as air pumps and auxiliary generators are driven through this transmission "hi-drive" on German locomotives. The BLH-New Haven application uses these two shafts for driving the locomotive during third-rail operation. The transmission is then operated at speeds comparable to those developed by the diesel engine in its lower speed ranges.

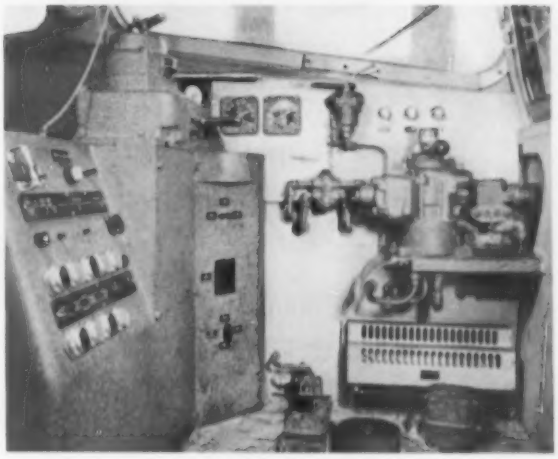
DIESEL HYDRAULIC PROPULSION UNIT

1—Cab signal equipment
2—Air brake control equipment
3—Emergency fuel cutoff
4—Fireman's seat
5—Engineer's seat
6—Cab heater
7—Hand brake
8—Speed indicator
9—Control stand
10—Parking brake valve
11—Electro-pneumatic brake valve
12—Cab signal ack. whistle
13—Cab signal acknowledger
14—Horn valve
15—Inspection reports (R.S.)
16—Fire extinguisher
17—Inspection door (transmission)
18—Water cooler
19—Air horn
20—Cooling—supercharger intercooler
21—Engine air filter—oil bath
22—Exhaust stack
23—Propulsion diesel engine
24—Torque converter transmission
25—Axle drive (with disengaging clutch)
26—Drive shaft
27—Lube oil filter
28—Lube oil level indicator
29—Lube oil drain
30—Brake cylinder
31—Sand fill
32—Sand box
33—Bell
34—Number and class light
35—Pre-lube pump
36—Lube filter (main engine)
37—Lube filter (auxiliary engine)
38—Fuel oil transfer pump
39—Propulsion engine compartment
40—Auxiliary diesel engine
41—Generator (a-c)
42—Exciter
43—Air filter panels
44—Air compressor
45—Auxiliary engine panel
46—Fuel oil tank
47—Fuel oil gage (R&L)
48—Fuel Oil Filler (R&L)
49—Grilles
50—Lifting eyes
51—Air reservoir
52—Cut-out cock
53—Drain cock
54—Water gage (expansion tank)
55—Radiator fan and motor
56—Radiator cores
57—Radiator shutters
58—Water pump (main)
59—Water pump (auxiliary)
60—Toilet
61—Water filler (toilet)
64—Coupler (train)
65—Coupler operating cylinder
71—Cab signal receiver
77—Auxiliary engine disengaging clutch
78—Generator driving motor (3rd rail)
79—Propulsion driving motors (3rd rail)
80—Resistor cabinet
81—M-u and third rail control equipment
82—Train power and locomotive control equip.
83—Battery charging, pump and fan control
84—Auxiliary motor speed control equipment
85—Third rail pickup arrangement





Cab of the locomotive has, at left, fireman's control station where there are lights indicating engine troubles and starting switches for propulsion and auxiliary diesel engines.

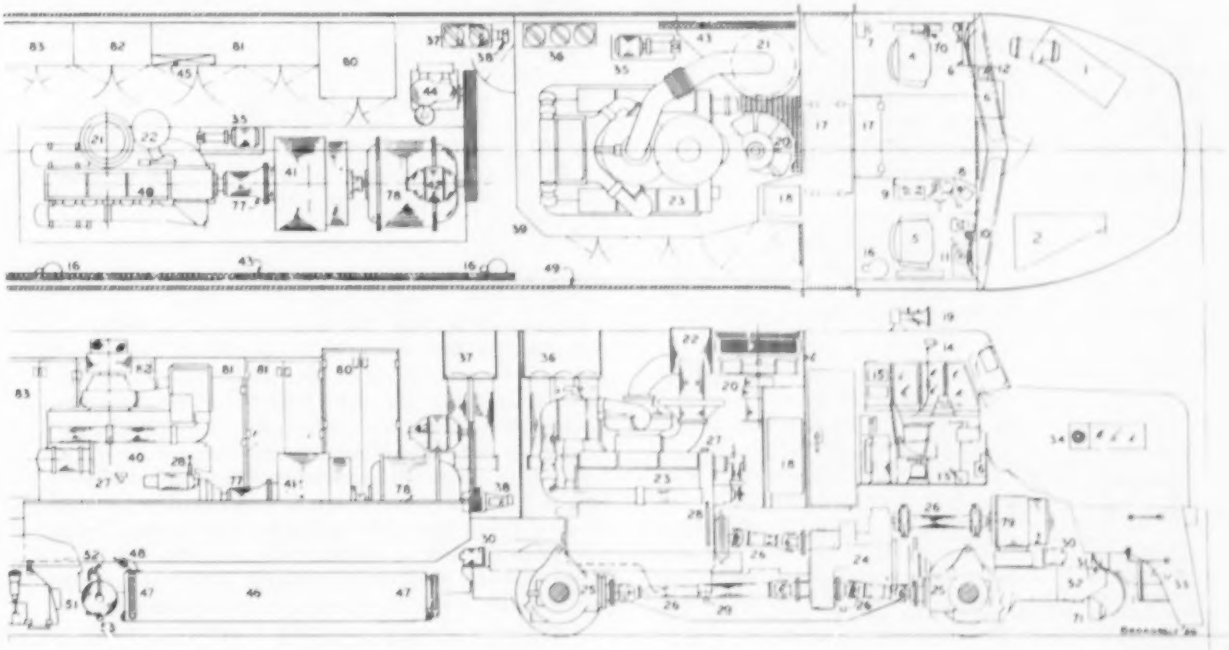


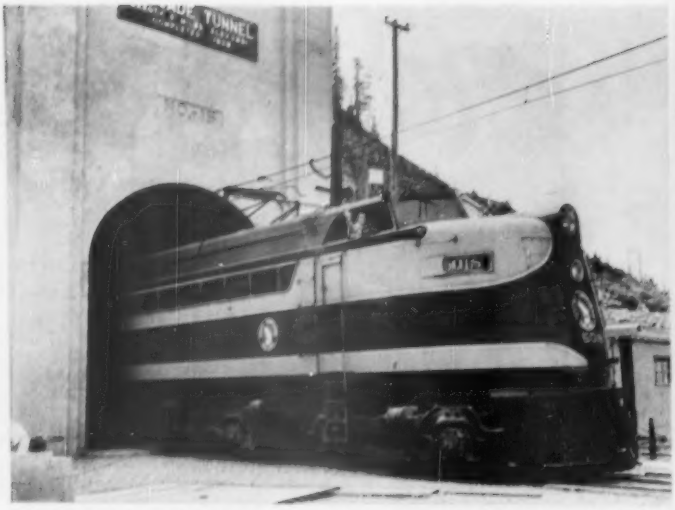
Engineer's equipment, above, includes the LWE brake valve, reverser throttle and, at top of control stand, switch for third rail or diesel operation.

The electric operation is a three-step one, with changes in horsepower and speed brought about by changing the motor connections. In each speed-power range there will be slight variations with changes in third rail voltage. Nominally 600-volt d-c specifications called for operation from 450-v to 750-volt d-c—and such variations are experienced. The two motors are connected in series with a resistor for starting. A time delay relay shorts out the resistor after the motors have started to turn over. They are then in series, and this continues through the *IDLE* and *RUN 1* throttle positions. *RUN 2* places the two motors in parallel, with series resistance in each circuit. *RUN 3* shunts out the resistance and produces the highest possible speed with electric operation. Further advancement of the throttle beyond *RUN 3* has no effect on motor speed. In general, the throttle acts like a transition lever during third-rail operation. At the nominal 600 volts, the output of each locomotive unit is:

		Motor Rpm	Locomotive Horsepower
Step 1	(Idle)	1,090	80
2		1,460	200
3		1,690	300

The motors are constantly connected to the torque converter, and are rotated by the diesel engine during the entire time the diesel is powering the train. There is a pneumatically-actuated Maybach overrrunning claw





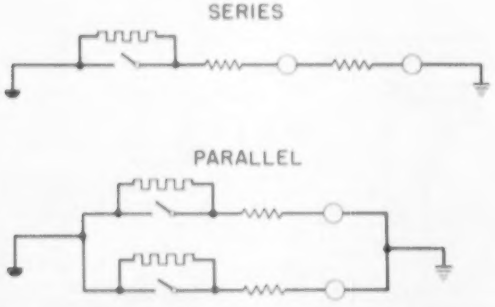
WORLD'S LARGEST single-cab electric locomotive, Great Northern No. 5018, with Engineer Andy Strom waving, clears east portal of the 8-mile Cascade Tunnel on final electric run on the system, July 31, 1956. At right: Interior of one of the two tubes housing ventilating fans with variable pitch blades. Fans force ventilating air into tunnel against trains coming up grade. (See page 75, September 1956 issue of Railway Locomotives and Cars).

clutch in the transmission which disconnects the diesel, during the time when the train is electric motor operated.

Auxiliary Power

For the third-rail operation, a 200-hp, compound d-c motor takes the place of the 465-hp Maybach engine in driving the 480-volt train power-alternator. Like the traction engine installation, there is a Maybach clutch between the engine and the alternator, but no method of disconnecting the electric motor from the alternator. Consequently, this d-c motor turns all the time that the alternator is running.

During d-c motor operation, exact speed regulation is important because of the a-c output. Because of the possible d-c voltage swing between 450 and 750 volts, there is a speed regulator to hold motor speed constant within this voltage range. Radiator fans and pumps on the propulsion and auxiliary engines are are a-c driven.



Basic electrical connections are shown in simplified schematics. The series connections (top) is that used in *IDLE* and *Run 1* throttle controller positions. The parallel hook-up (bottom) is used when the throttle handle is in the *Run 2* and *Run 3* positions.

Since this load does not exist with the engines shut down, it is possible to use a 200-hp to replace the 465-hp engine during third rail operation.

The a-c power for the train line will be supplied by the alternators on both units. The installations are wired to provide for serial starting of the two auxiliary engines when both are shut down. The lead unit is started first and brought up to speed. The field is then placed on the alternator, and the breaker closes to supply power to the three-phase trainline. The trailing unit's auxiliary engine is brought up to speed, and the breaker closes on the trailing unit trainline. The field is then applied to the trailing alternator so that the a-c power generated is properly phased with that from the lead unit.

Provision for starting the auxiliary and propulsion engines on the trailing unit are only two of the many operations which are controlled, remotely, from the lead unit. In addition to a few control circuits which are used in the coaches, the trailing locomotive control requires nearly all of the 42 circuits which are standard in the Train-X coupler.

Aluminum Used

Styling of the New Haven locomotives is somewhat different than that of the NYC locomotive. Widespread use is made of aluminum on these New Haven units. The exterior sheathing and nose of the locomotives are aluminum alloy sheets. The deck plates and the housing around the propulsion diesel are also aluminum alloy. By using this material, the additional weight introduced by the electrical equipment makes the total weight of the New Haven locomotive about the same as that of the all-steel NYC unit.

The New Haven diesels have electric immersion heaters in the water jackets for standby purposes, and also are equipped with Westinghouse LWE brake equipment.

Survey conducted by LMOA Committee shows . . . . .

How Relay Failures Can Be Reduced

C. A. Beaver presents the report.

Some practical suggestions on how to avoid locomotive failures caused by relays and contactors and minor defects

THE SO-CALLED "NICKEL AND DIME" failures of relays and contactors which may cause locomotive detentions were given special attention at the Locomotive Maintenance Officers' Association meeting, held in Chicago, on September 12, 1956. In presenting the report of the Committee on Diesel Electrical Maintenance, Chairman C. A. Beaver, general foreman, Bessemer & Lake Erie, stressed the importance of first deciding what is meant by the term "Service Life." He said:

"There are at least two ways of looking at this. First, we can consider the service life as being the length of time from when the equipment was new to the time it was removed from the locomotive and scrapped. The other way to consider service life is to say that it is the length of time from when the equipment was new or rebuilt until it failed in service. The object of all preventive maintenance is, of course, to try to make the "Failure Service Life" equal the "Scrap Service Life", if we may use those terms. That is to say, we try to maintain the equipment so that from new to scrap (which for most electrical equipment is a long time), it will function properly in service without failure. Naturally, costwise it is important to have the equipment last as long as possible before it has to be scrapped. However, it is much more important to have the equipment function in service without failures so that trains may run without delays. Therefore, our maintenance should be aimed in the direction of making the equipment run without failures. This, in itself, will prolong the ultimate life of the equipment."

It was decided by the Committee to first determine by means of a survey as much as possible, about current railroad practices concerning operation and maintenance of relays and contactors.

The first part of the survey asked some general questions. It showed that the number of road failures due to relays and contactors is as low as zero and as high as 8 per month. These failures represented a percentage of total failures of from zero to 30 per cent. The average was 2.3 failures per month, representing an average of 11.5 per cent of total failures. These figures must be tempered with the knowledge that the number of units operated ranged from 24 up to 321, with an average of 112. At first this appears to be a pretty good record. However, when it is considered that the electrical failure seems to draw the most attention, it becomes necessary to reduce this type of failure to a minimum. Sharing responsibility for these failures are the relays and contactors.

Failure of a locomotive enroute in revenue service is very costly to the railroad, for reasons which you all well know. Management is particularly critical of the train delays caused by failure of an interlock to close or open, or a relay contact which fails to make or break, or any number of such small items. With the exception of the cost of restoring the failed equipment, the cost of the resulting train delay may be just as great as if a crankshaft had failed.

Another question asked was how far the engineers, firemen and road foremen should be allowed to go in finding trouble on the road. The general opinion was that they should be allowed to reset ground relays, renew fuses, tighten cables, fix minor troubles with instruction from a maintenance point, and do only as much as is absolutely necessary to get the locomotive to a terminal. Most roads do not allow tinkering with equipment. Experience has shown that the unqualified person tinkering with equipment will cause more damage and failures than he corrects. This is shown by a study of the early history

of diesels when electrical failures were very high. This was when everybody was filing contacts. Contacts that were perfectly good would be ruined in this way. One major railroad is now running a six-year locked cabinet test of the new style EMD relays, contactors, and enclosed interlocks. The last inspection at the end of 27 months of operation indicated that they should easily reach their goal without maintenance, repair, or failure. The only work done has been to blow out the cabinet and grease the reverser segments. One of the major reasons for this is to get away from *Monkeyitis*.

It was also the general opinion that the engineers, firemen and road foremen could be of great service to the maintainer, if they had sufficient knowledge of the equipment and how it works, so that they would be able to give a detailed report as to how the equipment was acting at the time of the trouble. An accurate report goes a long way in helping the maintainer locate the trouble. The majority of the roads do not have written rules governing what these people are allowed to do. Some are now writing such rules.

The next three questions dealt with bench testing, periodic operating voltage check on coils, and a periodic interlock resistance check. The roads were about evenly split on bench testing, no doubt due to the number of units owned and whether they rebuild their own equipment or not. On the matter of checking the operating coil voltage and interlock resistance, four-fifths of the roads contacted did not do either.

The next series of questions pertained to cabinet cleaning. The vast majority of roads clean cabinets monthly by blowing with air and/or wiping the equipment with clean cloths. However most roads agreed that most failures came immediately after a periodic inspection when it might be expected that this would be the period of trouble free operation. A study of the reasons for these shows that a large percentage is caused by interlock failures. In each case, the interlock was functioning properly prior to the time the locomotive was brought in for periodic inspection.

Much of this post-inspection period trouble, the report states, can be eliminated by educating the maintenance forces and periodic policing to see that maintenance instructions are complied with.

There has been some very intelligent thinking done by one major railroad which had a sealed pressurized control cabinet under test. The cabinet was equipped with a filter and blower to try to extend the cleaning period. The basic purpose of this test was to determine the benefits of eliminating dust and dirt from the relays and contactors, along with the elimination of *Monkeyitis*. With the copper contact surfaces on the interlocks and contacts, there remains only the effects of the copper oxide formed, and the tests now under study by this railroad are for the purpose of determining the removal time of the oxide. This test was run for six months, at which time it was decided that the blower was too small, and the test was discontinued until a blower of proper size could be procured. With the silver alloys and dust-proof enclosures, many years of trouble free operation are predicted.

The survey also showed that on some roads there seems to be a lack of follow-up on failures. Most agree that causes of failures should be investigated. However, not all roads have some one designated to do this. It is recommended by the committee that in order to benefit by mistakes, there should be some one designated to investigate failures and keep a record of causes in order to correct poor conditions before they become of epidemic proportions. A complete analysis of failures and, most important, corrective action, is the essence of prolonging service life.

Specific subjects explored by the committee were starting contactors, battery charging contactors, battery field contactors, shunt field contactors, a-c contactors, power contactors and many types of relays. Information was also obtained concerning what manufacturers have done to extend the service life of relays and contactors.

Having gathered much information on current practices, the committee concludes that "first, there seems to be a lack of interest in analyzing troubles. For trouble-free operation, one must know what the trouble is, and then take steps to correct it. Second, there seems to be a lack of follow-up in seeing that items that are giving trouble are entered on the maintainance sheets. Third, there seems to be a lack of education for the men who do the work. Failure to give attention to any one of these things will cause you to have petty troubles continually."

Discussion

During the discussion, the opinion was expressed that the item which seemed to offer most in the prevention of relay failures is the sealed electrical cabinet. One member reported running a test with a sealed cabinet into which cooling air was supplied through a filter by means of a blower. At the end of the period, the cabinet contained some dust due to inadequate filtering, but the operation was successful. The doors of the cabinet were sealed with masking tape.

A question was raised about required inspections and it was explained that the cabinets were opened for inspection and resealed.

One railroad reported having sealed 53 electrical cabinets during November and December 1955. In some cases, the complete cabinet was sealed, and in others, only contacts were sealed. During the test most of the solid contacts were overheated and burned. This was later corrected by the use of silver shims and silver contacts. Although the experience was somewhat discouraging, it was felt that the use of sealed enclosures will be applied to all types of locomotives.

Another railroad reported that old contacts did just as well as new in sealed cabinet tests. Car seals, which could be broken in case of necessity were used to seal the cabinets.

A warning was made by one speaker, to avoid getting cabinet interiors so hot that ionized air might cause short circuits.

The use of hinged type contactors was reported as a means of obtaining better contact performance.

The question of how much repair work should be done by road personnel was brought up. This requires training, and one objection raised to such training was that it must include all of the older men who don't want to know. It was felt that this situation would work itself out.

Representatives of two roads reported that they had had better success in making ground tests with a leakage tester, than with ground resistance measurements. They expressed the opinion that by this means they will eventually be able to clear up grounds effectively.

HOW TO

Learn About Air Brakes

... AND HAVE FUN DOING IT

AB Brake Equipment

Air Brake in Color Schematics

AB Equipment—2A

The intent of this series is to present a simple schematic study of car air brakes starting with AB Freight Car Equipment. The descriptive wording will be as brief as possible and no attempt will be made to show actual dimensions or relative distances between parts. When using colors, those recommended and their significance are indicated at right: To preserve colors after application, the colored areas should be dampened with a brush and allowed to dry.

COLOR CHART

Brake Pipe	Yellow	Mongol 867
Auxiliary Reservoir	Dark Green	Mongol 868
Emergency Reservoir	Orange	Mongol 862
Brake Cylinder	Pink	Mongol 846
Quick Action Chamber	Heliotrope	Mongol 864

The six parts of the AB equipment are:

- The AB valve generally corresponding to the former triple valve. It controls admission and exhaust of air to and from the brake cylinder, and charges the reservoirs.
- The brake cylinder with its piston and rod.
- The two-compartment reservoir which combines the auxiliary and emergency reservoir volumes. The auxiliary reservoir supplies air for service applications and both reservoirs supply air for emergency applications. The emergency reservoir volume also assists in the recharge of the auxiliary reservoir.
- The combined dirt collector and cut-out cock mounted on the AB valve bracket.
- The branch pipe tee bolted to the car underframe. This tee is to prevent passage of excessive moisture from the brake pipe into the branch pipe and its fittings.
- The pressure retailing valve or release control retainer connected by piping to the AB valve exhaust.

The AB valve consists of three portions. At the center is the pipe bracket to which are bolted the service and the emergency portions. All pipe connections are made to this bracket so that pipe joints need not be disturbed when removing or replacing the operating portions of the AB valve. The bracket contains a removable hair or felt strainer and the quick action chamber. The service portion controls (either directly or through the emergency portion) the desired charging of the reservoir and the service application and release of the brakes. The emergency portion controls the quick action feature, the controlled high brake cylinder pressure, and the accelerated release function.

Equipment Arrangement

Note that in the simplified schematic of the AB equipment and piping that right angles appear in the pipes for convenience. These do not occur in actual applications. This diagram should be colored first.

SKETCH 1

Brake Pipe. With a yellow Mongol pencil, color the brake pipe starting at the AB pipe bracket and continuing through the combined dirt collector and cut-out cock, brake pipe tee and brake pipe. Dampen with brush and wait for drying.

Emergency Reservoir and Piping. With an orange Mongol pencil start at connection *2* at the bracket and color the piping and emergency reservoir. Dampen with a brush and let dry.

Auxiliary Reservoir and Piping. With a dark green Mongol pencil, start at connection *5* at the bracket coloring and piping and auxiliary reservoir. Dampen and let dry.

Brake Cylinder. With a pink Mongol pencil start coloring at connection *3* at the bracket. Color the piping and include the small space in the pressure end of the brake cylinder. Dampen and let dry.

Retaining Valve and Pipe. With the same pink pencil start at connection *10* at the bracket and color the piping to retaining valve. Dampen and let dry. These piping diagrams are colored despite the fact that there is no air in all of the pipes at the same time.

SKETCH 2

Charging the Service Portion. With a yellow pencil, color the brake pipe through the strainer into the chamber in front of service piston and through the passage leading through the charging chokes. Stop the yellow color at the entrance to the inner piston chamber. From

this point with the dark green pencil, color piston and slide valve chamber (all around the graduating valve and slide valve), and color to and including the auxiliary reservoir. Do not carry the dark green color entirely through the passage leading past the graduating valve which connects to the emergency reservoir. Start at the top face of the slide valve and color in orange to and including the emergency reservoir. Using a pink pencil, color in dashes the brake cylinder and retaining valve connections. In all cases dampen each color as completed and wait for it to dry before proceeding with the next color.

SKETCH 3

Charging the Emergency Portion. With a yellow pencil color the brake pipe through the strainer, the chamber in front of the emergency piston, and stop where the charging port to quick action chamber leads out of the piston chamber. With a heliotrope pencil, color from that point into and including the quick action chamber. Continue the heliotrope color into the inner piston chamber, the slide valve chamber, all around the slide and graduating valves and to the under side of the spill over check valve. With an orange pencil start at the spring end of spillover check valve and color all emergency reservoir connections including the short branch—the auxiliary reservoir via service slide valve. Dampen each color as completed and let dry.

Retarded Recharge

When during release brake pipe pressure is more than approximately 3 psi higher than that of auxiliary reservoir, the return spring at the end of service piston stem is compressed and the service piston, slide and graduating valves are moved to their extreme right hand position. This movement of the piston cuts off one of the charging ports in the piston bushing, reducing the rate of flow from the brake pipe to the auxiliary reservoir during charging. As only the front end brakes assume retarded recharge position, brake pipe air flow to the auxiliary reservoir is restricted on the front end of the train while brake pipe and auxiliary reservoir pressures are built up on the rear portion of the train at an increased rate providing a uniform recharge.

SKETCH 4

With a yellow pencil, color the brake pipe and the chamber in front of the service piston. Color charging passages in yellow, stopping at the point where the right hand passage connects with the inner piston chamber. At that point start the dark green color, and carry it into the inner piston and slide valve chambers. Stop the dark green color where the passage through the slide valve leads to the emergency reservoir. From the top of the slide valve fill in with orange to and including the emergency reservoir. With a pink pencil color in dashes the brake cylinder and retaining valve connections. Dampen each color as completed and let dry.

Brake Pipe Pressure Fluctuations

The stabilizing effect of the service piston spring device during an unintended reduction of brake pipe pressure can be shown. When such a reduction takes place, the spring stops movement of the piston to the left beyond the point where charging ports are cut off and communication between auxiliary and emergency reservoir volumes is closed. This prevents undesired quick service activity which might otherwise occur due to moderate fluctuations in brake pipe pressure.

SKETCH 5

With a yellow pencil color the brake pipe through the strainer into the space in front of service piston. With a dark green pencil color charging passages, slide valve chamber, inner piston chamber auxiliary reservoir pipe and auxiliary reservoir. With an orange pencil, color emergency reservoir passage (starting at the graduating valve) and on into the emergency reservoir. With a pink pencil color in dashes the brake cylinder and retaining valve connections. Dampen and let dry as in previous coloring operations.

Preliminary Quick Service

For preliminary quick service, as brake pipe reduction continues, enough differential is created to compress the piston spring. This moves the piston and graduating valve until ports are connected to establish communication between brake pipe and quick service volume, resulting in a local reduction of brake pipe pressure. This preliminary local reduction of brake pipe pressure, controlled by the graduating valve, results in rapid quick service action throughout the train. The quick service volume is permanently connected to atmosphere through a choke, and by this means brake pipe reduction is continued until the slide valve moves. After the quick service volume has been cut off by the slide valve movement, remaining air pressure in this volume is exhausted through a choke.

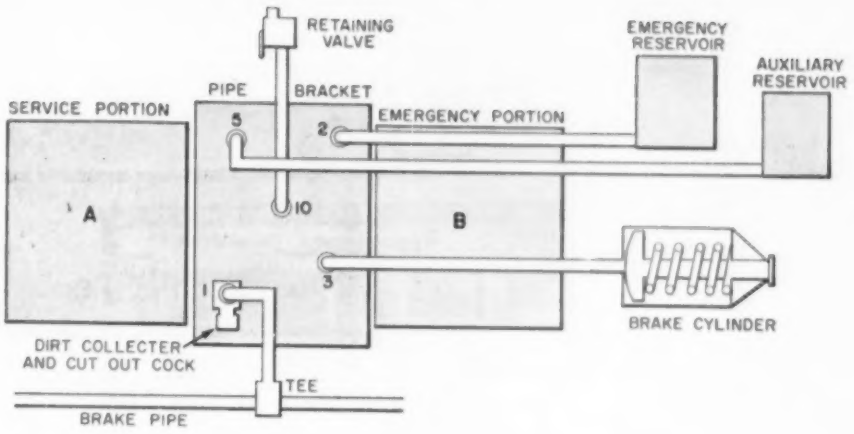
SKETCH 6

With a yellow pencil color the brake pipe through the strainer and into the chamber in front of service piston. Continue the color in the brake pipe branch through the slide and graduating valves and into the quick service volume. Carry the color into the choke and to the atmosphere. With the dark green pencil color the charging passages, slide valve, piston chambers and auxiliary reservoir pipe. With an orange pencil start at the graduating valve and color the passage and pipe marked emergency reservoir. Dampen colors and let dry.

SCHEMATIC DRAWINGS

On the following two pages are the schematic drawings of the AB equipment for which coloring instructions have been given above. In the captions of these drawings are brief explanations of the air flow. On the drawings are circled numbers indicating the sequence of operations. These numbers should not be confused with passage numbers or other designations used by the air brake companies. They are included here only to clarify and locate operating sequences.

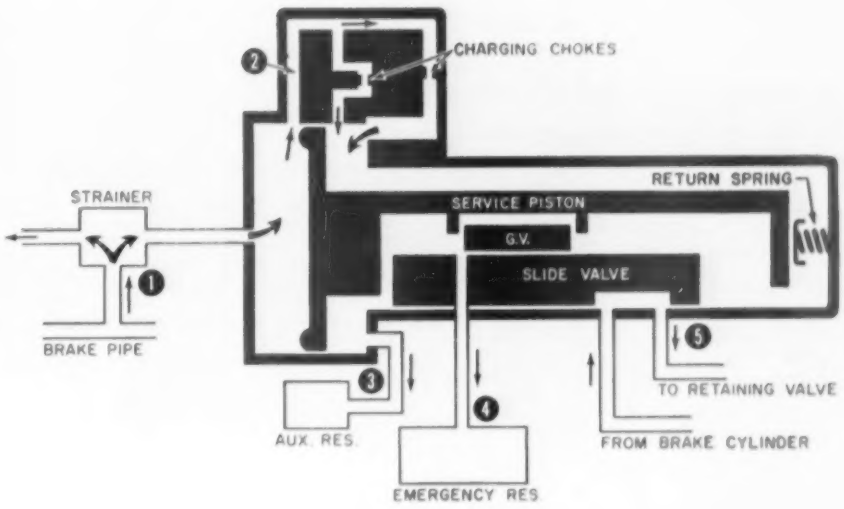
The previous installments of this series of air brake instructions have dealt with the 24-RL locomotive brake, and numbers used there have been the same pipe, port or passage designations used by the equipment manufacturers.

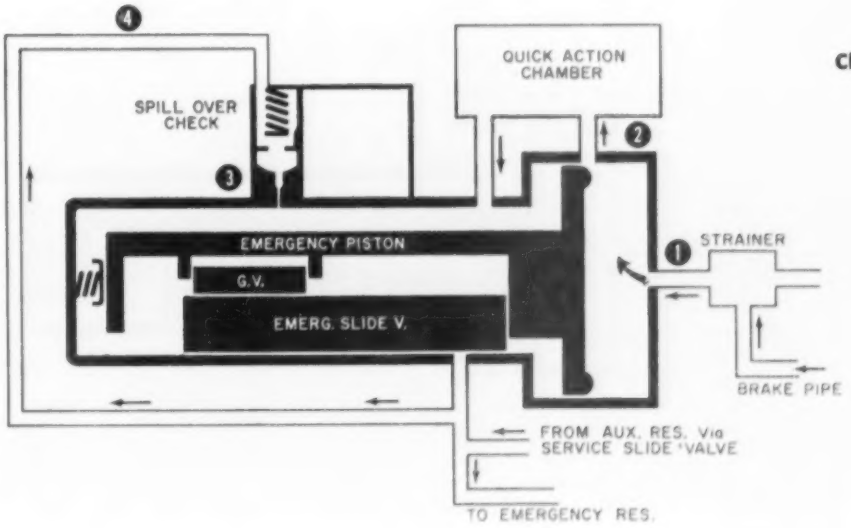


Sketch 1
Layout of AB Equipment

Sketch 2
Charging Service Portion

1. Brake Pipe air flows through strainer to chamber in front of Service Piston...
2. through both charging chokes to slide valve chamber and back of Service Piston...
3. from there to Auxiliary Reservoir.
4. Auxiliary Reservoir Pressure passes Graduating Valve, and goes through Slide Valve to Emergency Reservoir.
5. Brake cylinder passage is connected to retaining valve passage and pipe.





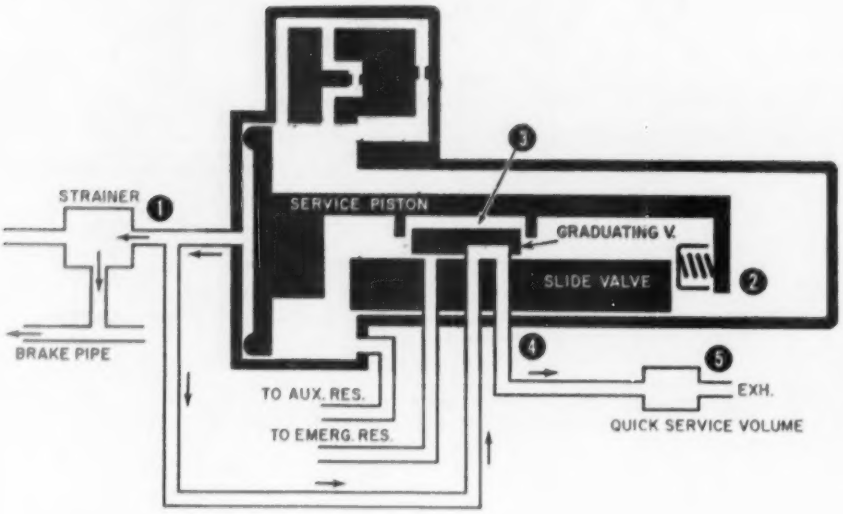
Sketch 3
Charging Emergency Portion

1. Brake Pipe air flows through strainer to outer face of Emergency Piston, and...
2. through charging port to Inner Piston Chamber and Slide Valve Chamber, and to Quick Action Chamber, then from...
3. Quick Action Chamber to face of Spill-Over Check Valve.
4. Emergency Reservoir air flows to spring side of Spill-Over Check Valve.

more next page ▶

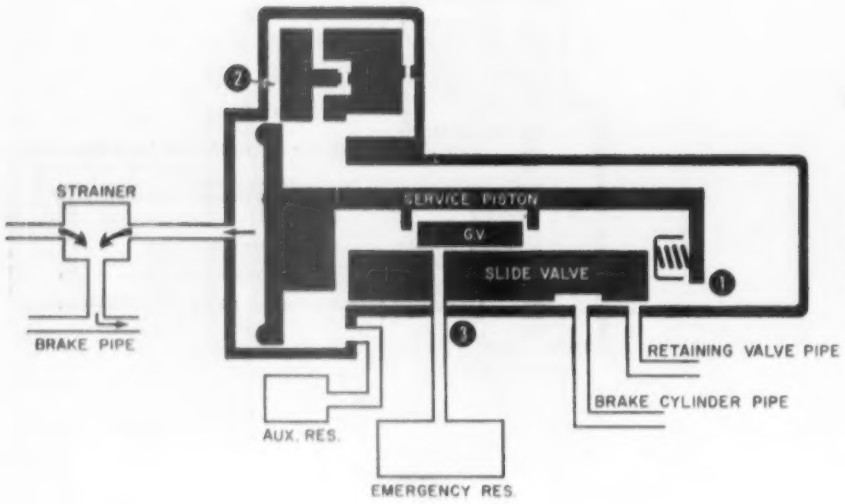
Sketch 4
Retarded Recharge

1. Service Piston Return Spring is compressed.
2. Piston has moved inward far enough to close one Charging Port.
3. Emergency Reservoir assists in recharging Auxiliary Reservoir.



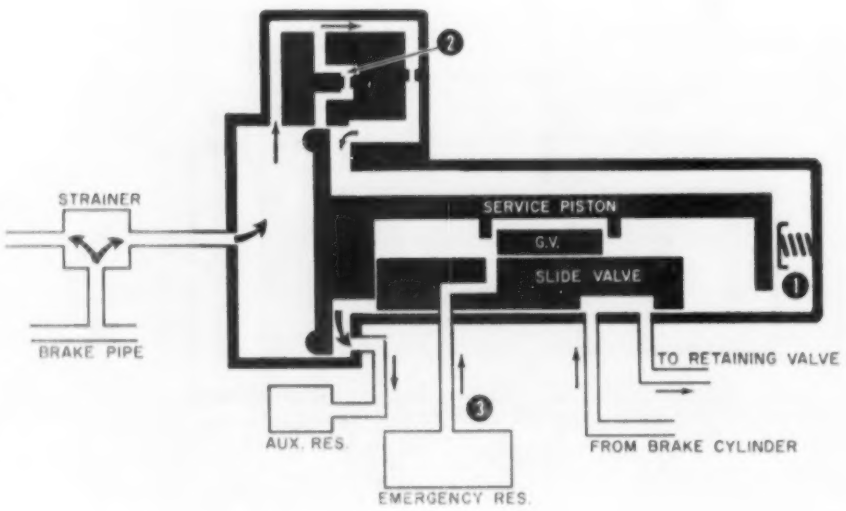
Sketch 5
Movement of Service Piston After Slight Reduction of Brake Pipe Pressure

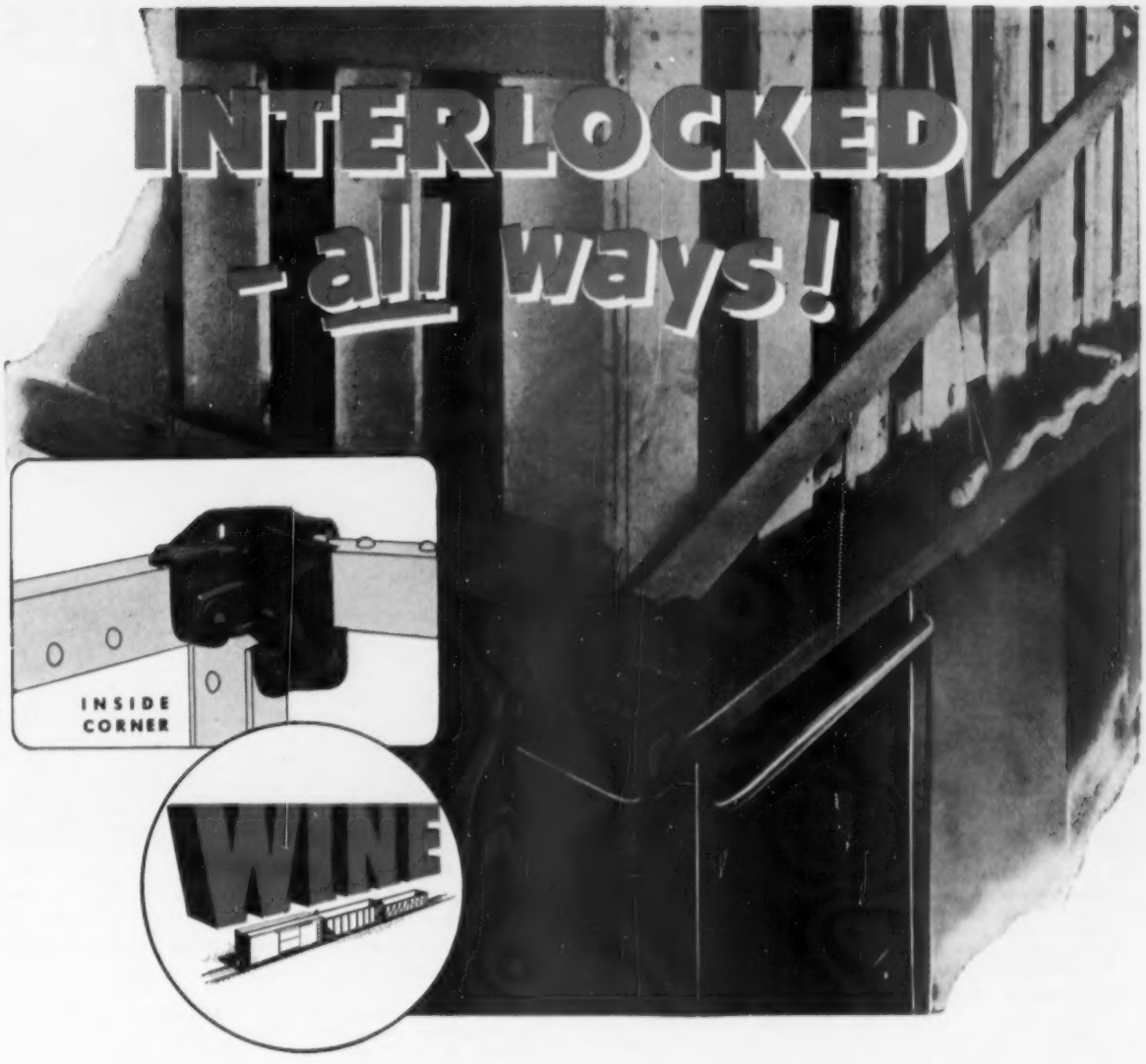
1. Service Piston Spring stops further movement of Piston.
2. Charging Port, brake pipe to auxiliary reservoir, is closed.
3. Graduating Valve closes port between Auxiliary Reservoir and Emergency Reservoir.



Sketch 6
Preliminary Quick Service

1. Brake Pipe pressure is reducing in front of Piston.
2. Piston moves out, compresses Piston Spring.
3. Graduating Valve moves on Slide Valve.
4. Brake pipe air goes through Slide and Graduating Valve to Quick Service Volume.
5. Quick Service Volume vents through choked opening to atmosphere.





DROP END LOCKS

KEEP CORNERS FROM SPREADING • WON'T ACCIDENTLY OPEN

The Wine Drop End Lock has an unequalled record for continuous service with minimum maintenance. Progressive developments include the addition of a pry-bar opening to facilitate easier drop end closing, even when the car structure is distorted from hard service.

The 3-way interlocking feature assures positive closure and retains the end and sides in their original relative position by preventing the sides from spreading at the corners. Equipped with the Wine Drop End Balancer in combination, one man closure of the heaviest drop ends is safe, fast and economical.

THE WINE RAILWAY APPLIANCE CO. TOLEDO 9, OHIO

QUESTIONS and ANSWERS

Interchange Rules

This is the nineteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

198-Q—Where cars equipped with journal roller bearings are destroyed on a foreign railroad, are they entitled to an additional allowance beyond the reproduction cost?
A—Yes. Under the present rules $550 for journal roller bearings may be added to the reproduction cost and the total depreciated from date car was built.

199-Q—In preparing billing repair cards for change of wheels made in trucks having journal boxes equipped with R-S journal stops, why is it important to indicate thereon that journal boxes are so equipped and also indicate that such stops were removed and replaced?
A—Because where journal boxes are equipped with R-S journal stops, additional charge of $4.24 per integral type truck involved in wheel change may be made.

200-Q—In performing light-weighing operations, would it be proper to run a string of coupled cars over track scale and record the weights as obtained in this manner?
A—No. It would not be proper to light-weigh cars coupled together under any circumstances. However, cars may be weighed in motion, uncoupled and free at both ends, on scales equipped with an automatic device for weighing and recording weights of cars in motion.

201-Q—In cases where wheels are removed account slid flat and none of the axle dimensions have reached the limits of wear upon removal as indicated in tables in Rule 86 but axle cannot be reapplied account journal dimensions increased or decreased beyond reapplication limits shown in Section (b) of Rule 86, should such axle be scrapped at the expense of the car owner?
A—No. In such cases the axle should be scrapped at the expense of the handling line.

202-Q—In cases where wheels are removed account slid flat and axle is scrapped account seamy condition of journal which requires turning to the extent that length is increased or diameter is decreased beyond limits suitable for reapplication, per Section (b) of Rule 86, is the handling line responsible for the scrapping of such axle?
A—No. Such axle should be scrapped at the expense of the car owner.

203-Q—Why is it necessary to show dimensions for solid type bottom rod connection and not necessary to specify dimensions for the forged hollow design?
A—Because Item No. 108 of Rule 101 provides a specific charge for the forged hollow design whereas the solid design is charged on a weight basis per Item No. 103 of Rule 101. In determining the length of wrought iron bottom rod connection, the measurement should be taken from center to center of outside holes.

204-Q—Where Westinghouse automatic brake slack adjuster is cleaned and oiled, etc., at the same time that "AB" air brakes are C.O.T. & S., what charges may be made versus the car owner?
A—Charge for C.O.T. & S. of "AB" air brakes may be made per Item No. 15 of Rule 111 and additional charge for work performed on the automatic brake slack adjuster may be made per Item No. 20-K of Passenger Car Rule No. 21.

205-Q—Where secondhand roller bearing axle is applied to a foreign car, how should material charge therefor be determined?
A—In computing secondhand prices for freight car roller bearing axles, it is proper to use 60% of the storehouse price for new finished axle less cost of machining, which is 472 mins at the current freight-car labor rate.

206-Q—Is it intended that the requirements of Rule 35 shall govern the matter of discharge doors left open on empty covered hopper cars?
A—Rule 35 does not apply to covered hopper cars. While Rule 35 was originated in the interests of safety of trainmen traversing open-top hopper and gondola cars, a covered hopper car running with discharge doors open does not present a safety hazard of this nature.

In some cases it is desirable to leave the bottom doors open for empty movement of covered hopper cars, and some roads have instructions posted to this effect. With other commodities it may be desirable to have the doors closed during empty movement. It therefore appears impractical to establish an arbitrary ruling regarding the closing of these doors after the lading is discharged and it is preferable to leave it to the handling road and consignee to reach an understanding on the practice to be followed to suit their individual requirements.

207-Q—Where insulation coating such as Flintkote is applied to inside surface of metal side sheet in connection with renewal of such side sheet on authority of defect card, would it be proper to make additional charge for such insulation coating?
A—Yes. Additional charge is proper for material and labor for such coating at actual cost.

DeLuxe Ride for Old King Coal

When the Western Maryland recently put in service a huge fleet of triple-hopper cars, it meant a long forward step for this progressive railroad. They're beautiful cars, but what's more to the point, they're as modern as today. And they are designed to give efficient, low-cost service for years to come.

No question about it, the coal hauled in this fleet gets de luxe transportation.

Among the many advanced features is the roller-bearing running-gear, which includes Bethlehem forged axles and Bethlehem wrought-steel wheels. The wheels are multiple-wear—a significant point in itself. For these are wheels that are built for extra-heavy duty, extra-long service, like everything else in the cars.

Whether your own road prefers a multiple-wear wheel or the familiar one-wear type, the Bethlehem shops are well equipped to supply you. Bethlehem wrought-steel wheels—and Bethlehem forged axles—can be bought and installed with complete confidence; they meet every requirement of AAR standards. You can obtain complete details about these products from the nearest Bethlehem sales office.

BETHLEHEM STEEL

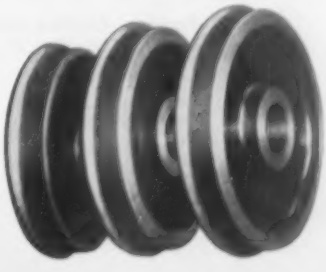
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM WROUGHT-STEEL WHEELS

COMPANIONS TO BETHLEHEM FORGED-STEEL AXLES

FREIGHT • PASSENGER • DIESEL



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Garlock replacement gaskets for diesel locomotives.

Garlock LATTICE BRAID* Rod Packing.

Garlock Molded Rubber Seal Rings.

69 years ago, Garlock began serving the packing requirements of railroads in the United States and Canada. Through the years, Garlock representatives have constantly kept abreast of the changing needs of railroad people... helping to save valuable time and reduce your maintenance and replacement costs.

For example: (1) From this long experience, better, longer lasting packing and gasketing materials have been developed. (2) Many hours of your time are regularly saved by Garlock's method of individually packaging and labeling replacement parts before shipment to you... the quantity and engine manufacturers' part number is clearly printed on each package. (3) To save you time in emergencies, Garlock diesel replacement parts are pre-stocked and packaged ready for immediate shipment from strategically located warehouses.

The proper replacement part for *every* diesel locomotive is included in "the famous Garlock 2,000"... two thousand different styles of packings, gaskets, and seals to meet all your needs... *only* complete line. That's why you get unbiased recommendations from your Garlock representative. Call him, or write for complete diesel parts and price list.

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For Prompt Service, *contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.*

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints

NEWS

(*Continued from page 8*)

ing in violation of Interchange Rule 66 because there has been a lack of definite information about periodic attention required by journal lubricators.

Instructions have been issued that lubricator-equipped boxes will, at 18-months' intervals, receive the same attention given to loose waste packed boxes except for handling the lubricator itself. The standard repacking charge will be assessed car owners when this work is done.

Instructions call for the lubricators to be removed, examined, "placed in as good condition as is consistent and then reapplied." Defective lubricators should be replaced with conventional journal box packing, and owner's disposition instructions requested.

According to W. M. Keller, executive vice-chairman, the Division is obtaining information on longer service by allowing some lubricators to operate up to 36 months. Such installations are experimental and limited. Data concerning handling of these lubricators are stencilled on the side of the car.

Cast-Iron Wheel Ban Approved

Cast-iron wheels will be prohibited on cars built new or rebuilt after January 1, 1958. This action has been taken by car owners in giving approval to a letter ballot on interchange rule revisions proposed by the AAR Mechanical Division's arbitration committee. Owners of over 93 per cent of the revenue freight car fleet voted approval for the ban.

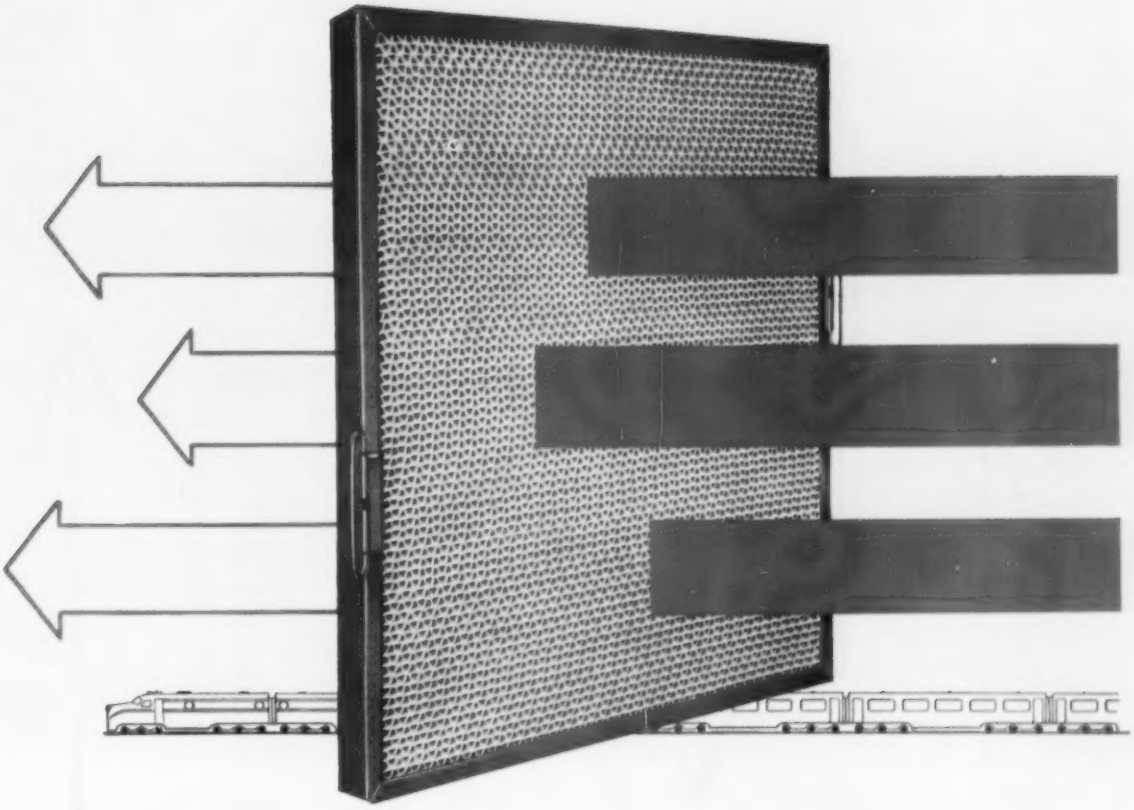
Another proposal winning approval permits group billing for car repairs by those railroads desiring to use the system. AAR member roads also voted to make mandatory a minimum clearance of 2¾-in. from the top of the rail to the lowest part of the car body or truck, an increase of ¼-in. from the previous minimum. To facilitate classification and handling of gondola cars, AAR members will be required to stencil a circled "W" symbol on the sides of those cars having wooden floors. In all a total of 59 letter ballot items were submitted to AAR members following recommendations made by committees of the Mechanical Division at the annual meeting in Chicago on June 26, 27, and 28, 1956.

Personal Mention

Atchison, Topeka & Santa Fe

J. D. SWAUGER appointed acting master mechanic, Pecos division, Clovis, N.M., relieving W. C. ELLISON on leave of absence.

(*Continued on page 98*)



Cut maintenance, increase engine life with Esso AIRFIL® Coating Oil

Esso's new AIRFIL Coating Oil for diesel engine air filters has such great dirt pick-up qualities that it can substantially cut maintenance costs and increase engine life. This is possible because of the reduction in abrasive wear, lessening the need for replacements of engine parts. You, too, can profit from these benefits by using Esso AIRFIL Coating Oil in diesel air intake filters, and in air-conditioning filters.

Esso AIRFIL COATING OIL offers three important advantages:

1. Easy to apply...won't drip off. In liquid form when hot, it may be applied quickly in the desired quantity, while at normal temperatures, it is a gel-like solid that won't run off.

2. Superior wicking qualities mean a continually fresh surface is presented to the air. Successive layers of dust are rapidly wetted, keeping dirt-retaining efficiency at a maximum.

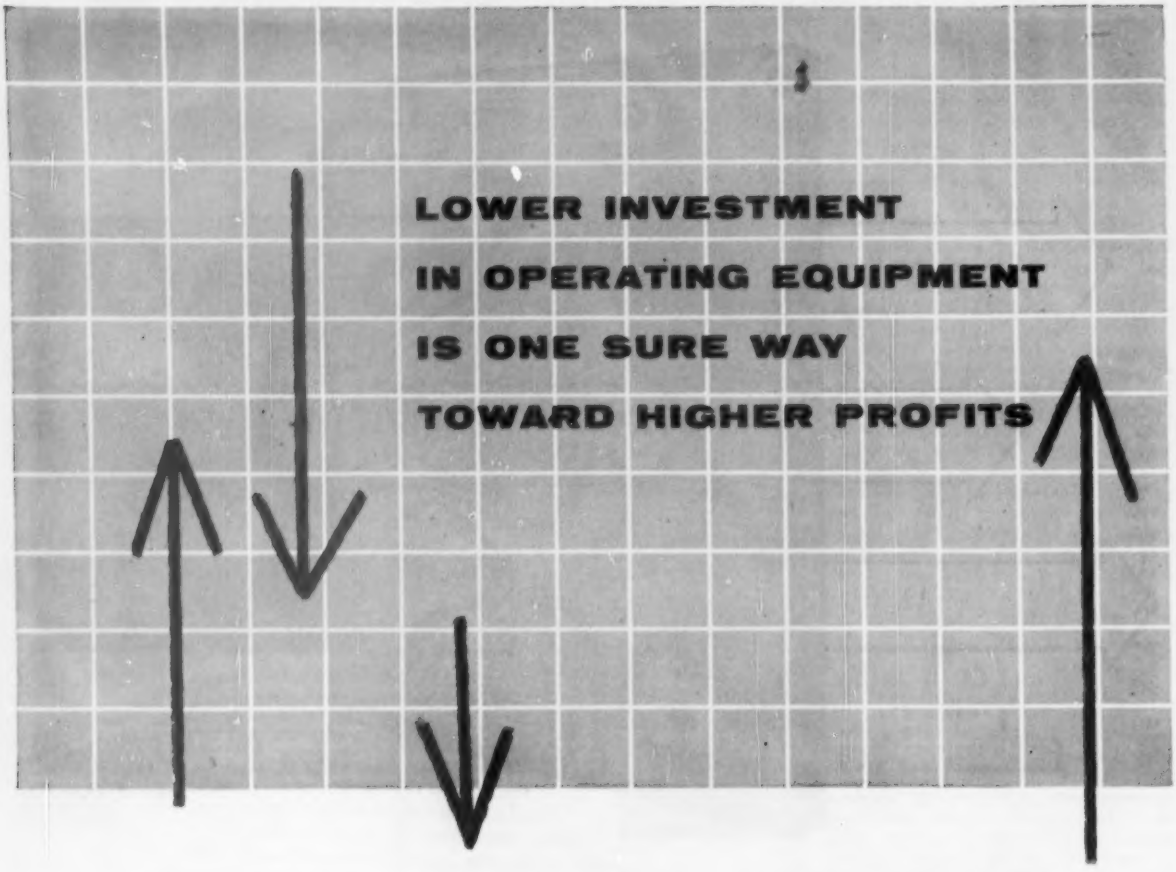
3. Insoluble in water . . . won't emulsify, and so resists removal by rain or snow, yet it can be removed quickly by hot detergent wash or steam blast.

Esso

RAILROAD PRODUCTS

Esso offers a complete line of dependable railroad products. Valuable years of experience in research and development, combined with continual testing on the road and in the lab, stand back of the outstanding performance of Esso Railroad products.

For data sheet regarding specifications of AIRFIL Coating Oil, write to Esso Standard Oil Company, Railroad Sales Division, 15 West 51st Street, New York 19, N. Y.



take car wheels, for example

Sure, we know car wheels represent a small portion of a railroad's investment, but a penny saved is *still* a penny earned.

Your railroad can save as much as $15,000 in first cost on 800 chilled car wheels for maintenance service, and still have the best *AMCCW* wheels in history. In many types of freight car service this is a practical, economical, sensible way to more profits.

Economy is not the only reason for recommending *AMCCW* chilled car wheels (see list below), but the transfer of $15,000 from investment to the profit side of the ledger for every 100 cars can make a lot of sense in your freight car operation.

low first cost
low exchange rates
reduced inventory
short-haul delivery
increased ton mileage
high safety standards
complete AMCCW inspection
easier shop handling

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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Albany Car Wheel Co. • Southern Wheel (American Brake Shoe Co.)
Griffin Wheel Co. • ACF Industries • Marshall Car Wheel & Foundry Co.
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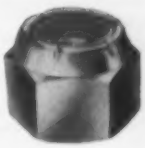
Canadian Car & Foundry Co., Ltd.

HOW TO ELIMINATE "BAD ORDER CAR" DOWN-TIME DUE TO FASTENER FAILURE

High speed freight hauling has emphasized the importance of such typical fastener "tough spots" as the AB valve and the brake cylinder and reservoir. This problem of costly fastener failures can become especially critical on specialized equipment such as hopper cars subjected to shaker service, which are continually in bad order due to loose air brake equipment.

The present tremendous effort to replace obsolete rolling stock with modern equipment designed and built to perform efficiently under the increasingly severe conditions imposed by modern traffic operations has focused attention on improved freight car design . . . and fastener requirements are included. As a contributing factor to reducing the number of "bad-order" cars and minimizing inspection and repair costs, leading American railroads are currently specifying the protection of Elastic Stop® nuts for all bolted applications in the vital areas.

For over 27 years American heavy industry has used vibration-proof Elastic Stop nuts on the "tough spots"



where ordinary fasteners perform unsatisfactorily due to severe shock loads, vibration and impact. Positive cost savings result from reduced inspection and fastener maintenance requirements. And only the red elastic locking collar protects internal bolt threads against corrosion!

For detailed information on preventive maintenance savings provided by vibration-proof Elastic Stop nut fastening methods on locomotives, passenger and freight cars, write Railway Sales Division, Dept. N89-1123.

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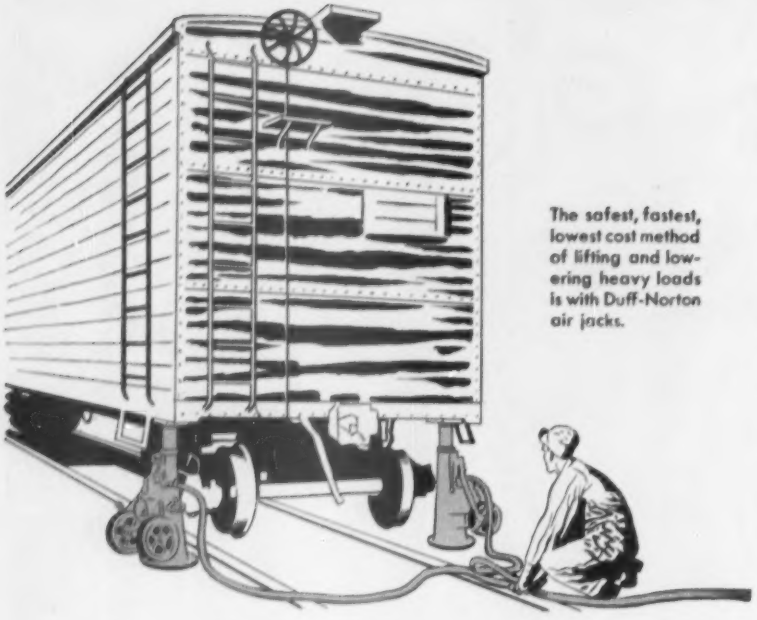
ELASTIC STOP NUT CORPORATION OF AMERICA

2330 Vauxhall Road, Union, New Jersey

ROLLPIN TRADEMARK



The safest, fastest, lowest cost method of lifting and lowering heavy loads is with Duff-Norton air jacks.

How one man with air power can lift an empty car in less than 2 minutes!

One man wheels a pair of precision built, 20-ton capacity, 28-in. high Duff-Norton air motor powered screw jacks (Model 228-R) into position one at a time, connects them to the "Y" valve, then turns the dual controls and up goes the car 18 inches (the maximum height) in less than 2 minutes. Ordinary shop pressure of 80-100 lbs is all you need to operate these time and money saving jacks.

Other models available in 35, 50, 75, 100-ton capacities capable of lifting and holding the heaviest diesels or cars without danger of creeping, over-running, or dropping the load because these are safe, dependable, time-tested screw jacks with air power used only to turn the screw. Even if the air failed or line were severed, *load couldn't drop*. Air motor must be used also to lower load.

Thousands of these jacks are in use by leading roads throughout the world and have been for 20 years.

If you use air now for other tools, why not use it to raise and lower locomotives, cars (empty or loaded), handle heavy machinery, repair bridges, push large diameter culvert pipe through solid earth or fill?

Write for 8-page illustrated brochure giving complete specifications on the 6 models available and how they pay for themselves in a short time. Ask the world's oldest and largest manufacturer of lifting jacks for brochure AD-11-G, Duff-Norton Company, Pittsburgh 30, Pa. There's no charge or obligation whatsoever.

DUFF-NORTON

"Giving The Railroads A Lift Since 1883" **Jacks**

PERSONAL MENTION

(Continued from page 94)

Canadian National

NORMAN E. FRASER, acting locomotive and car foreman at Bridgewater, N.S., appointed locomotive and car foreman.

Canadian Pacific

RAY CHRISTIE appointed master mechanic at Montreal, Que., terminals. Formerly master mechanic, Dominion Atlantic.

E. B. WHEELER, master mechanic, Brownville division, appointed division master mechanic at Toronto, Ont., terminals.

G. E. BALES, division master mechanic at Montreal, Que., terminals, appointed master mechanic, Brownville division.

Chicago & North Western

R. E. COUGHLAN, chief metallurgist and engineer of tests at Chicago, retired on October 31.

Chicago, Milwaukee, St. Paul & Pacific

J. H. KERVIN appointed assistant master mechanic, Trans-Missouri Division west of Mobridge, S.D., and Rocky Mountain Division, including Lewiston, Mont., and Great Falls. Headquarters, Deer Lodge, Mont.

J. L. BROSSARD master mechanic at Minneapolis, has had jurisdiction extended to cover locomotive department at Mobridge, S.D.

Dominion Atlantic

ROY THOMPSON appointed master mechanic at Kentville, N.S.

Missouri Pacific

W. F. DUNCAN, terminal master mechanic at North Little Rock, Ark., appointed acting mechanical superintendent, Gulf District, at Houston, Tex., relieving H. B. Baney, on leave of absence.

G. W. NIEMEYER, road master mechanic, North Little Rock, Ark., appointed terminal master mechanic.

H. E. JAMISON appointed road master mechanic, North Little Rock, Ark.

St. Louis Southwestern

L. E. SMITH, mechanical foreman at Mount Pleasant, appointed general foreman at Texarkana, Tex.

Seaboard Air Line

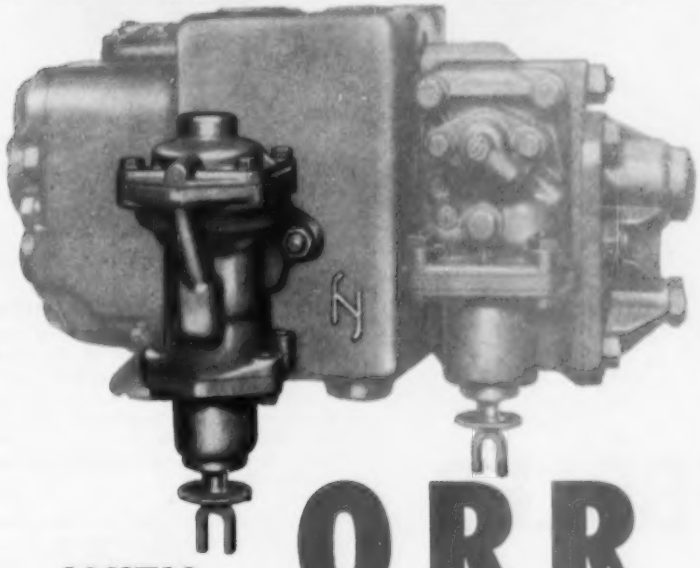
W. C. BAKER, SR., assistant superintendent car department at Tampa, Fla., retired.

O. G. WOOD, JR., general foreman car department, appointed assistant superintendent car department, succeeding Mr. Baker but with headquarters at Jacksonville, Fla.

A. W. LEITNER, assistant superintendent car department at Norfolk, Va., transferred to Jacksonville, Fla.

J. R. HAYES and E. F. SANBORN, diesel supervisors, transferred to Hermitage, Va., and Jacksonville, Fla., respectively.

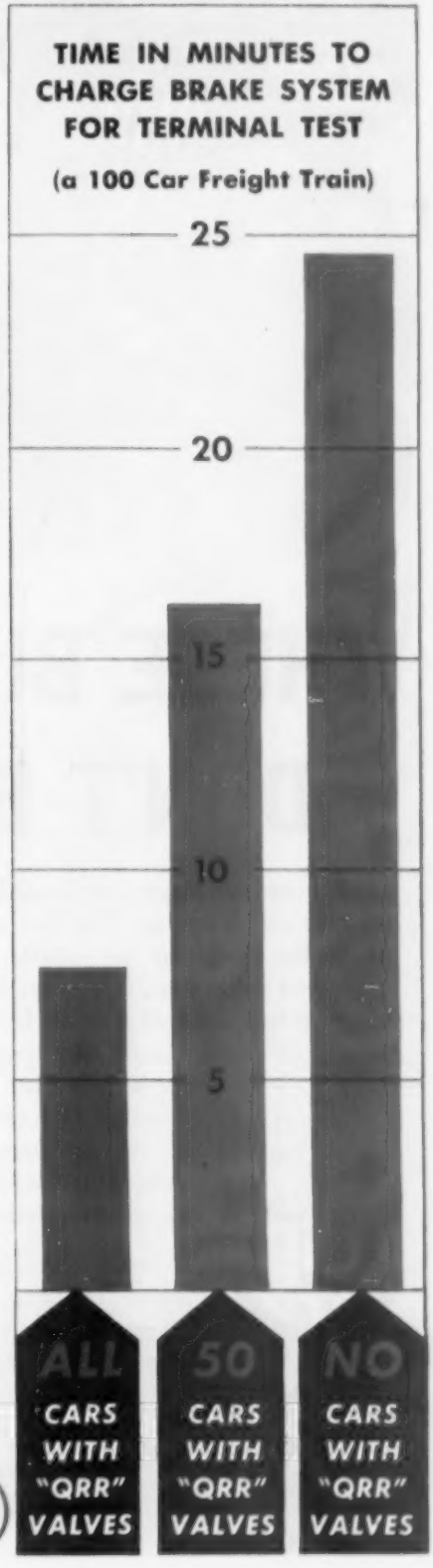
SPEED UP DEPARTURE of Your FAST FREIGHTS...



WITH... QRR BRAKE CYLINDER RELEASE VALVES

Save time required for Air Brake tests! With the "QRR" Brake Cylinder Release Valve, air stored in the "AB" Reservoirs is retained when cars are bled for switching. As shown in the chart at the right, up to 70% of the Charging Time required for a 100 Car Train is SAVED when all cars are equipped with "QRR" Brake Cylinder Release Valves. Proportionate Savings in Time are effected with only a portion of the train so equipped.

"QRR" is the proven design authorized by the A.A.R. for unlimited application.



Write for circular 99.

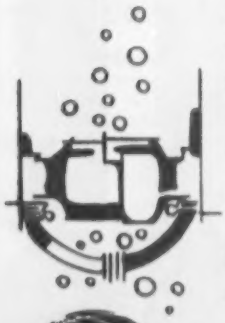
RPI MEMBER

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

THESE BUBBLES DON'T BURST

Bubbles from Magnus Air Brake Testing Soap are tough—their skin is stronger than that of the usual testing soap bubble. And they are reliable. Like sensitive, highly trained police dogs, they instantly spot the sneakiest air brake leak and hold it at bay for identification. They are equally effective in the shop or in the yards for a quick check-up job. Weather doesn't bother them. For years railroads all over the country—north, south, east west—have employed them to guard their air brake systems.



If your air brake testing procedure has proved to be a bursting bubble—try Magnus Air Brake Testing Soap. Write Magnus, 77 South Avenue, Garwood, N.J.

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AUTOMOTIVE DIVISION
MAGNUS CHEMICAL CO., INC.

SUPPLY TRADE NOTES

Lewis T. Gibbs

UNITED STATES STEEL CORPORATION.—*Lewis T. Gibbs* has been appointed manager, and *Stanley C. Lore*, assistant manager, of the company's high-strength-steel sales division. Mr. Gibbs, who succeeds *M. B. Sunderland*, retired, was previously assistant manager of railroad sales and assistant manager of high-strength-steel sales.

■

ENGINEERING CONTROLS INC., NEMEC COMBUSTION ENGINEERS INC., —Nemec and Engineering Controls have combined their efforts on the engineering and marketing of equipment and automatic controls for dual fuel oil systems for all types of diesel engines. Sales information may be obtained from Engineering Controls Inc., Paul Brown building, St. Louis 1.

■

CHICAGO RAILWAY EQUIPMENT COMPANY.—*R. A. LeBeau* has been appointed assistant to vice-president—sales.

■

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*John E. Earp*, sales staff assistant, has been appointed southeastern sales representative, eastern sales district, at New York.

■

WARREN CHEMICAL MANUFACTURING COMPANY.—The Boston office and plant has been moved to 600 Pleasant street, Norwood, Mass.

■

HUNT-SPILLER MANUFACTURING CORPORATION.—*Ellis E. Walker, Jr.*, has joined the railroad sales organization at Boston. Mr. Walker was previously assistant manager of special service at the Billerica Shops of the Boston & Maine.

■

DANA CORPORATION.—*G. Leonard Smith* has been appointed mid-western representative; headquarters, Chicago.

■

KAISER ALUMINUM & CHEMICAL SALES, INC.—*Gerald J. Weihofen* has been appointed railroad industry specialist, with headquarters in Chicago. Mr. Weihofen was formerly western editor, Railway Locomotives and Cars.

MOTOR WHEEL
"Center Articulated" Lid Design Gives A *Lifetime* Closure

Motor Wheel Standard and Deep Flange Lids can be removed or installed in a matter of seconds – and without tools. Time tested . . . oil and dust tight . . . full 4-way articulation. The extended housing arm facilitates raising lid, opens a full 120° for easy journal box service.

MOTOR WHEEL CORPORATION
LANSING 3, MICHIGAN U. S. A.

NATIONAL RAILWAY SALES REPRESENTATIVE

T-Z RAILWAY EQUIPMENT CO., G. S. Turner, President
8 SOUTH MICHIGAN • CHICAGO 3, ILLINOIS

NEW

THE ONLY

SURFACE GRINDER with a POSITIVE SAFETY SHUT-OFF!

PLUS THESE OTHER COST-SAVING OPERATING ADVANTAGES:

- Handles can be set at 90° or 120° for close corner work and operator comfort . . . another Ingersoll-Rand FIRST!
- A responsive governor insures maximum cutting speed and minimum air consumption regardless of load.
- Single point lubrication, double-sealed wheel bearings, large oil reservoir for long life, low cost operation.
- Top of tool is flat for easy pressure application.
- Available in 2 Models and 4 speeds as follows:

  Speeds: 3100—4100—4500—and 6000 rpm.

  Size 41F with push-locking throttle for constant operation.

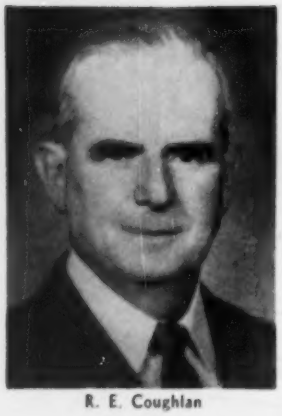
  Size 41FX with self-closing, safety type throttle.

Ask for a demonstration of this new safety grinder in your shop.

8-343

Ingersoll-Rand

11 Broadway, New York 4, N.Y.



R. E. Coughlan

ALLIED RAILWAY SUPPLY ASSOCIATION.—*R. E. Coughlan*, retired chief metallurgist and engineer of tests of the Chicago & North Western, has been appointed secretary-treasurer of the association.

Mr. Coughlan is a graduate of Northwestern University. His career began with the C&NW upon graduation in 1911 as a chemist. He was subsequently material inspector, fuel-oil inspector, supervisor of water supply, engineer of tests, and chief metallurgist and engineer of tests.

■

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE *Division.—G. F. Greenip*, district sales representative, has been appointed regional sales engineer at St. Louis. The following have been appointed district sales representatives: *R. E. Hill* at St. Louis; *A. E. Roberts* at Chicago, and *Paul C. Ganzer* at Chicago. Mr. Hill was previously sales engineer at La Grange, Ill; Mr. Roberts, district engineer at San Bernardino, Cal., and Mr. Ganzer, district engineer at Chicago. *David R. Kendell*, manufacturing manager for rebuild, has been appointed superintendent of manufacturing operations in the new building now under construction at the La Grange, Ill., plant.

■

ALL-STATE WELDING ALLOYS COMPANY.—*John Strother* of Concord, Tenn., has been appointed regional manager in charge of sales and service in east south central and south Atlantic states.

■

RUST-OLEUM CORPORATION.—*Alfred P. Emery* of the John N. Thorp Company, Brooklyn, N. Y., has been appointed railroad sales manager, supervising the sale of Rust-Oleum protective coatings and Molub-Alloy in Brooklyn, Boston, Camden, New Haven, Norfolk, and Baltimore.

■

C & D BATTERIES, INC.—*Stanley C. Alexander* has been appointed a sales representative at Dearborn, Mich.

■

UNION CARBIDE AND CARBON CORP., NATIONAL CARBON COMPANY.—*Wm. C. McCosh* has been appointed manager of railroad and industrial brush sales, with headquarters in New York. Mr. McCosh was previously manager of the central division of carbon product sales at Chicago. *J. W. Scales* has been appointed manager of the mid-eastern division and *R. L. West-*

lake, manager of the central division of the carbon products sales department, with headquarters in Pittsburgh and Chicago, respectively. *A. W. Wolff* has been named manager of carbon specialty sales, with headquarters in Cleveland.

■

UNITED STATES RUBBER COMPANY. —*T. Benton Sevison, Jr.*, has been added to the staff handling sales of Trilock in the transportation and industrial fields.

■

TOLEDO PIPE THREADING MACHINE COMPANY.—*Howard A. Mikesell*, vice-president and sales manager, has retired.

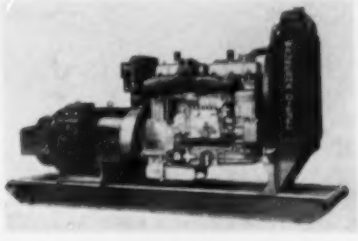
Obituary

ROBERT B. POGUE, consulting engineer and former vice-president for engineering of the Brake Shoe & Castings Division, American Brake Shoe Company, died suddenly on September 26.

EDWIN B. MEISSNER, 71, president of the St. Louis Car Company, died at his home in Clayton, Mo., September 10.

EQUIPMENT

(Continued from page 4)



Engine-Generator Sets

Industrial Enginator sets are available with capacities of from 50 to 600 kw. They were built for operation on gas, gasoline, or diesel fuels and permit a steady flow of power for continuous, intermittent, and stand-by duty.

The Model 148 diesel is produced in capacities of from 50 to 120 kw. It is manufactured as a normal diesel with standard crankshaft, as a normal diesel with counterbalanced crankshaft, or as a turbosupercharged diesel with counterbalanced crankshaft. *Waukesha Motor Company, Dept. RLC, Waukesha, Wis.*

Hose Assembly

This hose assembly of fluorocarbon resin, jacketed in a stainless-steel braid, is an airless system of spraying. It carries hot solvents, such as spray-coating paints, lacquers, and other finishing materials, and pressures of 500-600 psi and temperatures of 160-180 deg F hold solvents near the boiling point.

The assembly consists of an extruded Teflon resin tube equipped with a steel

Have you seen what this CAN DO FOR YOU?

Torque control IMPACTOOL

NEW accuracy and speed for precision nut running jobs . . .

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

* 2 TORSION BARS PROVIDE MULTIPLE TORQUE SETTINGS

- No. L735 Max. torque 60 ft. lbs.
- No. H735 Max. torque 90 ft. lbs.

For torques up to 550 ft. lbs. a Size 5340T Torque Control Impactool is available.

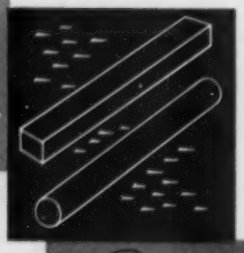
Get a free demonstration of Ingersoll-Rand Torque Control Impactools by an I-R AIR engineer now... or write for additional information.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.
IMPACTOOL DIVISION

8-342

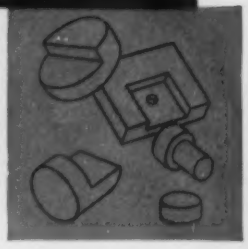
MECHANICAL SHAFT SEALS

New Stackpole oil seals greatly reduce pitting, blistering, spalling. Many other types for use with air, gases, corrosive chemicals and other liquids.



MAXIMUM SALT BATH RECTIFICATION

Stackpole Carbon Rods in electric salt bath furnaces avoid decarburization. Heating is fast and uniform. "Drag out" is minimized, electrode life increased.



RESISTANCE WELDING and BRAZING TIPS

. . . that last 3 to 4 times as long.
Stackpole "F" treatment minimizes oxidation, reduces dressing by ⅓, assures longer life.

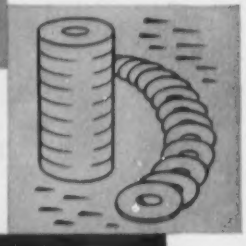
STACKPOLE

CARBON-GRAPHITE *materials and components*

Boost Efficiency • Reduce Costs

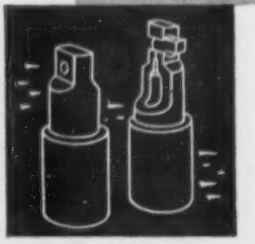
POROUS CARBON *that is 75% AIR*

A typical example of carbon versatility, this new Stackpole material has many potential uses as filters, etc. Has high electrical conductivity and high resistance to chemical attack. Is stable at high temperatures.



FOR CRITICAL VOLTAGE CONTROL

Stackpole Carbon Discs (piles) offer maximum control efficiency as pressure-sensitive resistance elements over a broad range of critical voltage control work. Write for catalog.



EASY SOLUTIONS TO MOLD and DIE PROBLEMS

Carbon molds and dies are readily formed or machined. Extremely high heat capacity plus ability to maintain strength at elevated temperatures makes them ideal for foundry, glass molding, powder metallurgy and other uses.

STACKPOLE CARBON COMPANY • *St. Marys, Pa.*

OTHER STACKPOLE PRODUCTS INCLUDE: BRUSHES for all rotating electrical equipment • carbon-graphite and metal powder ELECTRICAL CONTACTS CHEMICAL ANODES • CATHODIC PROTECTION GROUND RODS • BRAZING BOATS and TRAYS • BEARINGS • TUBE ANODES • FRICTION SEGMENTS • CLUTCH RINGS • PUMP VANES • WELDING CARBONS • RESISTANCE WELDING and BRAZING TIPS • SPECTROGRAPHITE • ELECTRIC FURNACE HEATING ELEMENTS • WATER HEATER and PASTEURIZATION ELECTRODES . . . and many more.

jacket and three-piece steel couplings. The tube, which is inert to solvents, withstands temperatures to 500 deg F and pressures to 3000 psi.

The spraying system consists of a piston pumping unit, paint heater, hose and spray gun, integrated into a three-piece assembly. At generated pressure, the material passes through the 4000-watt heater which elevates and controls temperature to any predetermined value. According to the manufacturer, this system reduces required amount of coating material spraying by as much as 50 per cent. *Resistoflex Corporation, Dept. RLC, Roseland, N.J.*

Remote Control Bender

This "One Shot" device, according to its manufacturer, can make any degree of bend in one setting. It is said to be suitable for the bending of pipe, rigid conduit, EMT and radiant heat copper tubing. The bender can be used anywhere and in any position and saves on cutting, threading, welding, handling and assembling operations.

Model RC 200/C has bending shoes to handle 1 to 2 in. capacities, while Model RC 200/PH will handle ½ in. to 2 in. capacities. Net weight of the unit is 68 lb.

The unit can be supplied with an electric motor pump. Its bending frame has a removable top-plate which permits laying the pipe in from the top, sliding in from the side, or hooking over installed pipe. *Tal Bender, Inc., Dept. RLC, 417 N. Water street, Milwaukee 2.*

Epoxy Resin Tank Repair Kit

Patches for making repairs to metal tanks, pipes and conduit, using an epoxy resin material called Sonite and glass cloth, have been tested to over 1000 psi for extended periods.

The resin is said to have chemical stability and good adhesion to metals. It

(*Continued on page 114*)

THE

M-F

UNI-TORQUE

LOCK NUT

has something

more

than the standard holding features of ordinary lock nuts.

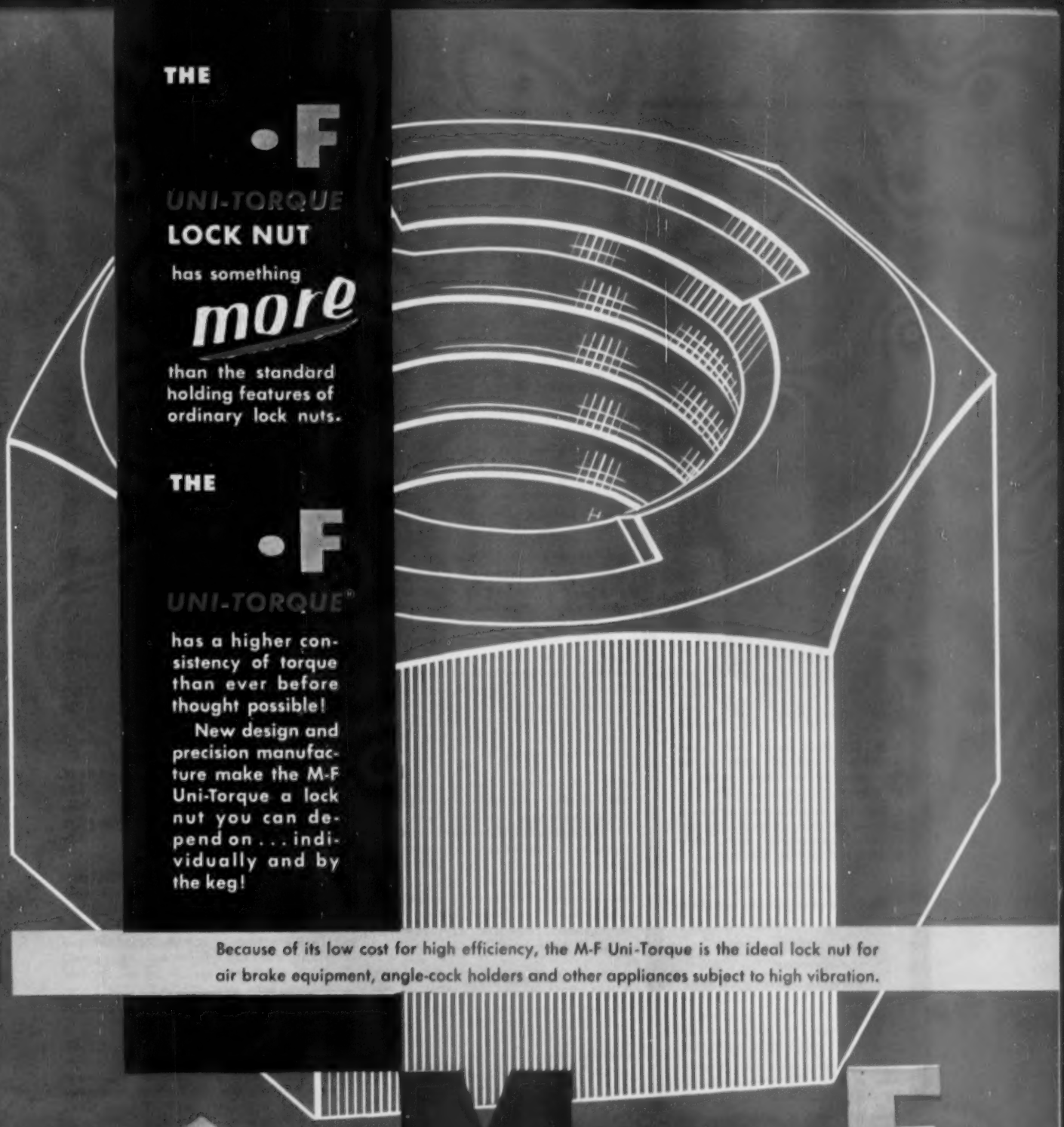
THE

M-F

UNI-TORQUE®

has a higher consistency of torque than ever before thought possible!

New design and precision manufacture make the M-F Uni-Torque a lock nut you can depend on . . . individually and by the keg!



Because of its low cost for high efficiency, the M-F Uni-Torque is the ideal lock nut for air brake equipment, angle-cock holders and other appliances subject to high vibration.

M-F LOCK NUT
No. 1
Used with a standard nut. Spins on.

M-F LOCK NUT
No. 2
Spins on, locks itself and holds.

MEMBER

MAC LEAN FOGG

Lock Nut Company

5535 NORTH WOLCOTT AVENUE,
CHICAGO 40, ILLINOIS

In Canada:
THE HOLDEN CO., LTD., MONTREAL

LOCK NUTS • WATERTIGHT BOLTS • SPECIAL BOLTS • FLOOR CLIPS • STANDARD NUTS • LADING STRAP ANCHORS •

the Perfect Cleaner

F.O.-128

(low toxicity — high flash)

FOR ALL DIESEL

ELECTRICAL EQUIPMENT

FINE ORGANICS

SAFE-TEE® SOLVENTS

F. O. - 128 does away with carbon tetrachloride and all other cleaners that may be a health hazard to personnel.

F. O. — 128 increases cleaning and degreasing efficiency — does away with excessive maintenance costs, motor failures and wasted man hours.

- **zero residue on drying**
- **fifteen times more safe than carbon tetrachloride**
- **will no attack insuations**
- **non-corrosive**
- **will not produce dermatitis**

These unusual characteristics of F. O. - 128 makes it ideal for cleaning all types of Diesel, electrical equipment.

Check into the safety and effectiveness of F. O. - 128. Write today for details.

Now being used by an everincreasing number of railroads from coast to coast.

Also Available —
F. O. - 102 and F. O. - 162— Carbon Removers
F. O. - 106 and F. O. - 116— Emulsion Cleaners

Our representative will be glad to call upon request. Write to Det.

FINE ORGANICS, Inc.

211 East 19th St - New York 3, N. Y.

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

WIRE ROPE. 86-page illustrated catalog describes Tiger Brand wire rope and gives directions for its handling and care. Glossary defines some of the more unusual words and terms commonly used by those who work with wire rope. (Write *American Steel & Wire Division, United States Steel Corporation*, Dept. RLC, Rockefeller Building, Cleveland 13.)

BATTERY TRUCK MOTOR. 6-page bulletin (GEA-6532) gives design, construction and application features of a new traction motor for low-voltage electric vehicles. Includes performance data, available ratings and mounting information. (Write: *General Electric Company*, Dept. RLC, Schenectady 5, N.Y.)

DYE PENETRANT INSPECTIONS. 4-page folder, "How To Perform Dye Penetrant Inspections," a "manual of established and proved rules" for performing inspections by the penetrant process. Covers pre-cleaning, appplying penetrant, removing excess penetrant, applying developer and interpreting results. Chart gives recommended penetrating times for various types of materials and various types of suspected defects at various temperatures. (Write: *Turco Products, Inc.* Dept RLC, 6135 South Central avenue, Los Angeles 1.)

PIPE INSULATION. 40-page catalog (No. 904) presents new way to specify proper thickness for pipe insulation, based on the "J" factor. Drawings show how single-layer Unibestos is applied to various vertical and horizontal expansion joints, and to pipe bends, flanges, valves and fittings. Physical and thermal characteristics charted and tabulated. (Write: *Union Asbestos & Rubber Company*, Dept. RLC, 1111 West Perry street, Bloomington, Ill.)

TESTING MACHINE FOR LUBRICANTS. Bulletin 106 describes the Model LFW-1 lubricant machine for testing both bonded coatings and liquid lubricants. Operation diagrammatically visualized. Specifications both in English and metric systems included. (Write: *Alpha Molykote Corporation*, Dept. RLC, Stamford, Conn.)

FLASH LIGHTS AND LANTERNS. Catalog (No. 566) marks 50th anniversary of company. Covers full line of flash lights, lanterns, safety lights, carbide lamps and safety cans, including special lights for railroads. Table gives performance characteristics of bulb and battery combinations, including burning life of batteries and correct bulbs to use with various dry cells, depending upon amount of light and battery life desired. (Write: Dept. 66, *Justrite Manufacturing Company*, Dept. RLC, Chicago 14.)

WIRE ROPE ASSEMBLIES. 24-page catalog (5601) gives dimensions, drawings, capacities, and sizes of terminals and wire rope for many swaged wire rope assemblies. Assemblies consist of a length of PREformed wire rope at each end of which a different terminal fitting can be attached. (Write: *Public Relations Department, Macwhyte Company*, Dept. RLC, Kenosha, Wis.)

D.C. HYPOTS. 4-page Bulletin 14-2 describes portable bench type and mobile direct-current Hypots for high-potential testing for dielectric strength and for insulation resistance. Data sheets included with bulletin cover some of newest models having output voltage ranges of 0-70,000 volts d-c. (Write: *Associated Research Inc.*, Dept. RLC, 3758 W. Belmont avenue, Chicago 18.)

POWER TRANSMISSION MACHINERY. 328-page catalog, with 8-page index, gives helpful information on Dodge line of mechanical power transmission products, including sectional drawings, dimensions, weights, application details and engineering tables. (Write: *Dodge Manufacturing Corporation*, Dept. RLC, Mishawaka, Ind.)

X-WELD CHAIN. 4-page bulletin, DH-319 describes Accoloy X-Weld 125 chain for sling chains, banding chains, load binders, towing chains and boomer chains. Includes specifications, weights and dimensions. Describes aslo properties and applications of specially manufactured heat-resisting and acid-resisting X-weld chains and studs. (Write: *American Chain & Cable Co.*, Dept. RLC, 929 Connecticut avenue, Bridgeport 2, Conn.)

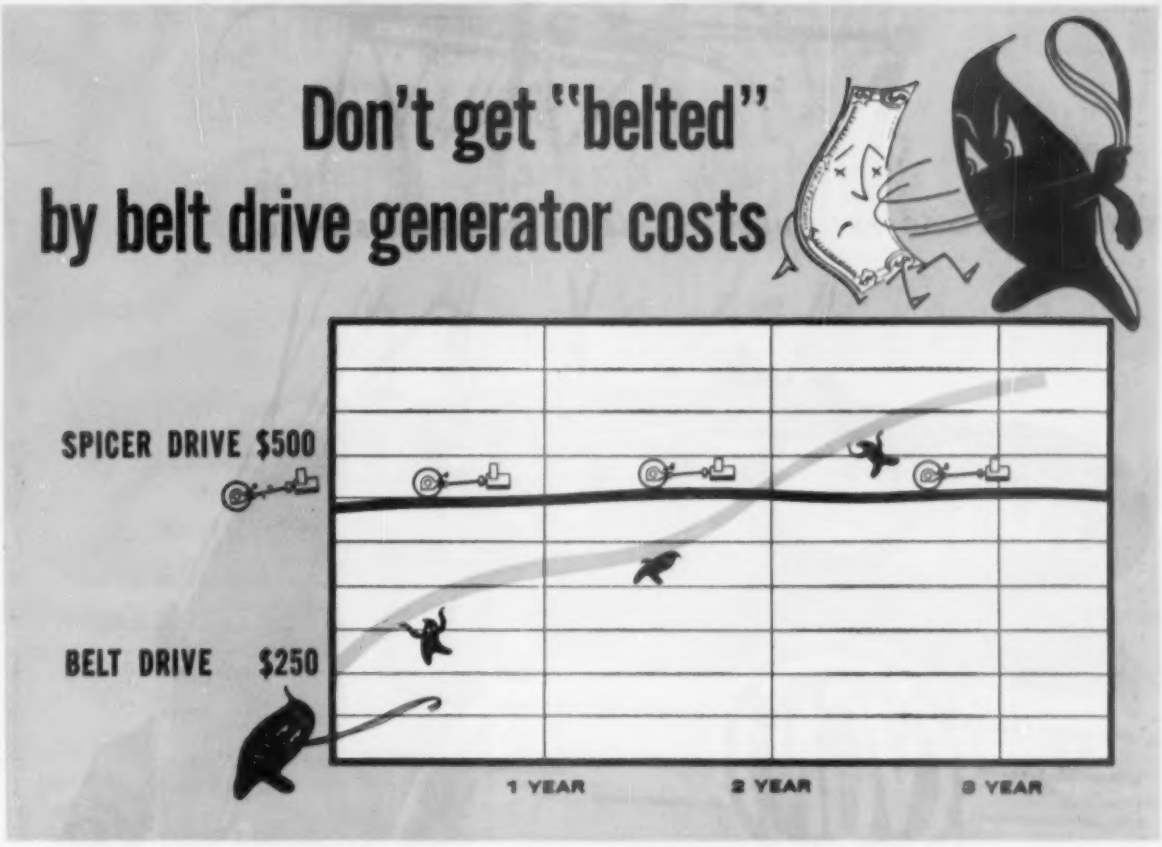
STEAM GENERATOR REPAIRS. "Running Repair Redbook" (Bulletin 255) a complete guide to maintaining and understanding operation of the Vapor-Clarkson Model OK-4625 steam generator. "Find It and Fix It" chart and schematic piping diagram aid in locating system, or control, needing inspection or adjustment. (Write: *Vapor Heating Corporation*, Dept. RLC, 6420 West Howard street, Chicago 31.)

AIRTURNS. Four-page catalog F7912 describes the Uni-Flo Airturn and gives performance data to determine elbow pressure losses throughout air-distribution system. (Write: Dept. 766, *Barber-Colman Company*, Dept. RLC, Rockford, Ill.)

HOSE REELS. 20-page general catalog describes features, design and manufacture of hose reels for every use. (Write: *Clifford B. Rookey & Son, Inc.*, Dept. RLC, 242 Maple street, Westerlo, N.Y.)

WELDING ROD CHART. 4-page Bulletin DH-1218-J details the physical properties as welded; gives analysis, tensile strength, elongation, and average Rockwell hardness, and lists typical uses of gas welding rods, bare electrodes, automatic welding wire, and metal spray wire. (Write: *Page Steel and Wire Division, American Chain & Cable Co.*, Dept. RLC, Monessen, Pa.)

Don't get "belted" by belt drive generator costs



Get the actual costs between belt-drive and Spicer Positive-Drive Generators . . . and find out what belt drives really cost you!

How much are replacement belts going to cost you?

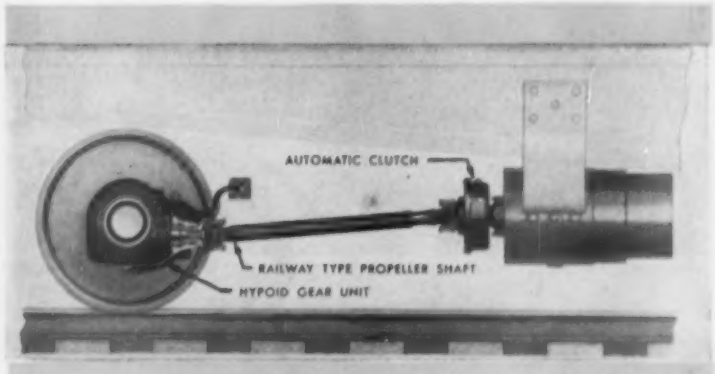
How often will they need replacement?

How much will labor for belt replacement cost?

How much will depleted batteries and shorter battery life due to belt failure cost you?

How much will loss of communications and its subsequent dangers cost you?

These are constant and continuing belt cost factors you cannot escape. Investigate the long-life economies and dependable performance of the Spicer Positive Generator Drive before you buy! Five ratios available for driving all makes and types of generators up to 5 KW.



Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.

DANA CORPORATION
Toledo 1, Ohio

Spicer

SPICER PRODUCTS: TRANSMISSIONS UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES STAMPINGS • SPICER and AUBURN CLUTCHES PARISH FRAMES • SPICER FRAMES

KEY TO RAILROAD PROGRESS . . . ELECTRICAL PIONEERING
130
130
VGN

Virginian Railway Company Gets New General Electric Rectifier Locomotives Designed Specifically to Move Heavy Tonnage More Economically

Twelve new General Electric rectifier locomotives will soon be operating on the Virginian Railway. These locomotives, the first rectifier-electrics designed specifically for freight service, will develop 3300 hp, and boast a continuous tractive effort that will permit them to haul heavier freight trains economically.

As designed by G-E engineers, electrical equipment in the locomotive will convert high voltage A-C from the overhead wire to low voltage D-C that will drive six G-E-752 traction motors. In combination with the power transformers, rectifier tubes form the heart of the conversion system.

For more information about these new electric locomotives, contact your G-E Apparatus Sales Office, or write Section 135-6, General Electric Company, Locomotive and Car Equipment Dept., Erie, Pa.

ENGINEERS AND WORKMEN at General Electric's Erie, Pa. Works stand by waiting signal for lowering of locomotive body onto the six-wheel trucks.

NEW VIRGINIAN RECTIFIER LOCOMOTIVE sees the sun for the first time on General Electric's test track. This locomotive will soon be operating between Mullins, W. Va., and Roanoke, Va.

Progress Is Our Most Important Product

GENERAL ELECTRIC

WHEN YOU INSPECT AXLES . . .

Reduce Your Man-Hours

Find *all* the Cracks, Not Just Some of Them

MAGNAGLO equipment—designed especially for railroads—gives you low-cost inspection in the least possible man-hours. It makes inspection fast—and fully reliable.

When you spend any man-hours to inspect axles, you want to be sure you find *all* cracks. This is insurance against road failures that can range from costly to disasterous. On freight cars today's inspection need is MAGNAGLO. For passenger car axles MAGNAGLO is a *must!*

MAGNAGLO makes sure that *every* axle that goes back into service is *fit* for service. Under MAGNAGLO black light, any cracks instantly show as glowing, flourescent indications, impossible to miss. You *know* whether your axles are free from cracks. It is also the *only* way to detect copper penetration in axles, one cause of axle failure.

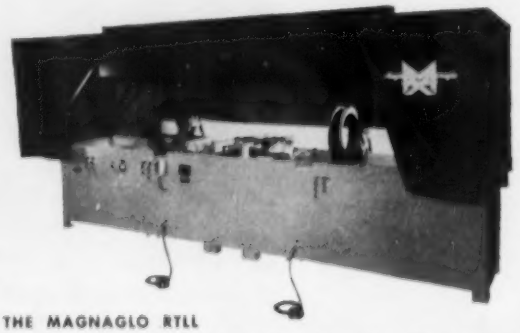
MAGNAFLUX CORPORATION
7320 Lawrence Avenue • Chicago 31, Illinois
New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 19 • Los Angeles 58

OTHER EQUIPMENT AVAILABLE—FOR MAGNAGLO ON MOUNTED AXLES. WRITE US—WE'LL SEND FULL INFORMATION.

SPECIALLY DESIGNED—FOR AXLE INSPECTION

THE MAGNAGLO XRTL (above)

Designed to reduce handling in small and medium shops. Enables one man to inspect more axles with MAGNAGLO better than two men could in the past with old style equipment. A special axle supporting roller makes it easy to rotate axles. An external Magnaflux power pack used with XRTL also can be used for general shop inspection. A similar unit, the RTL, includes a built-in power pack.



THE MAGNAGLO RTLL

Developed especially for high volume inspection. Gives you all the advantages of MAGNAGLO, plus automatic axle roll-in, automatic motor driven magnetizing coils, motorized rotation of axles and ejection. Heavy duty construction is engineered for day-after-day shop use in high speed inspection. Man-hour needs are *at minimum!*

MAGNAFLUX

STRENGTH—WHERE STRENGTH IS NEEDED

The floors of today's freight cars take a terrific pounding—from loads and loading equipment as well as from hammers and nails. That's why it is important to specify the modern flooring —N-S-F*—that adds structural strength to critical points in the underframe, can outwear the car itself. And N-S-F has a special antiskid surface that's safer for personnel. In fact, this flooring is so strong, smooth and safe—and provides such good blocking—that shippers everywhere recognize progressive railroading when they see N-S-F in freight cars.

*N-S-F (T.M.): NAILABLE STEEL FLOORING

Made and sold by

STRAN-STEEL CORPORATION

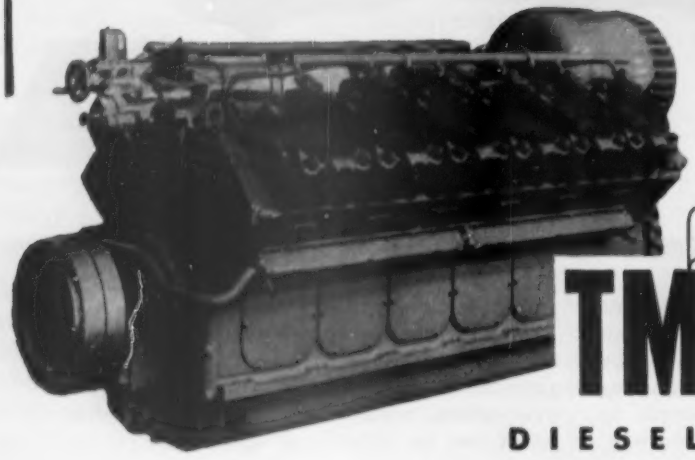
Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

In Canada, N-S-F is made and sold by International Equipment Co., Ltd., Montreal. Complete engineering and cost data available from our representatives in Chicago, New York, Philadelphia, St. Louis, Cleveland, San Francisco, Minneapolis and Atlanta.

M-55-44A

DEUTZ



TM 625

DIESEL LOCOMOTIVES
powered by slow-speed 2-stroke DEUTZ diesel engines and equipped with hydraulic transmissions, for shunting and line service, with 4 to 12 cylinders, output ranging from 240 to 2000 HP

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USG® BRUSH GRADES AY 32 AND 2306

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USG Brush Grades AY 32 and 2306 have proved their high performance in main generators on Diesel-electric locomotives in every type of service. Because of longer life USG Brushes actually reduce down time due to generator overhaul. Brush replacement as well as commutator wear is held to a minimum. A performance test on your equipment will prove that USG Brushes will give you superior commutation and longer service life. Only USG Brushes have Statite® . . . the permanent shunt connection that cannot be pulled out or jarred loose. Statite retains its original low millivolt shunt drop. Now's the time to try USG Brush Grades AY 32 and 2306 with Statite connections that have never failed in millions of miles of railroad service! Why not order today?

Send for the latest USG Brush Catalog B-56 and the new USG Brush Grade List, both are excellent for designing or for specific applications.

223

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

EQUIPMENT

(Continued from page 104)

is oil and waterproof, resists acids and alkalis and will withstand temperatures to 200 deg F. It is available in white, Sonite P-2, and aluminum, Sonite P-5. *Smooth-On Manufacturing Company, Dept. RLC, Jersey City 4, N.J.*

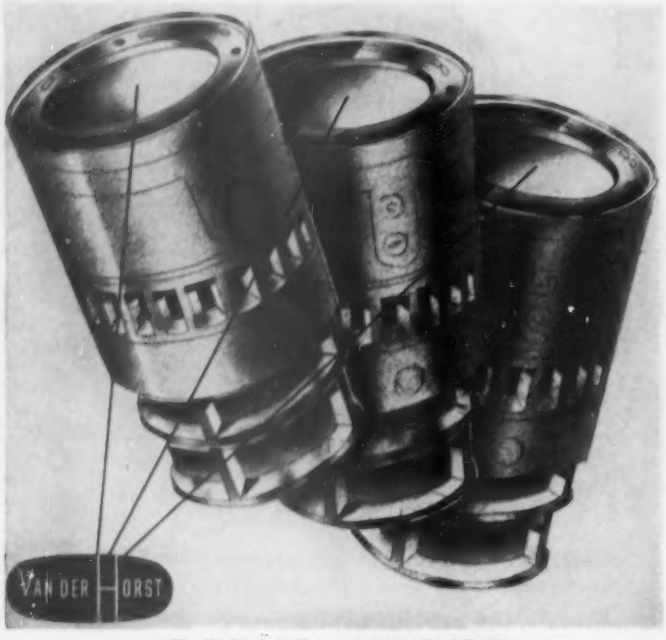
Electrical Caboose System

An AC-DC electrical system, designed especially for railway cabooses, has a full output of 165 amp. Power is available for such necessities as electric marker lights, two-way radio, and interior lighting, as well as power to operate other accessories that may be needed.

Typical installations include a gear drive, which is manufactured in different drive ratios to meet the requirements of all types of operations, and a belt drive, which permits the drive ratio to be varied by altering the pulley sizes. The generator can also be adapted to various other types of drive mechanisms.

The Delco-Remy system is available as a complete package—AC generator with mounting bracket, two selenium rectifiers, a carbon pile regulator and relay rectifier. *Delco-Remy Division General Motors Corporation, Dept. RLC, Anderson, Ind.)*

5 *big advantages of*



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- INCREASES PISTON RING LIFE UP TO 50%.
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- DEFINITELY CONTRIBUTES TO REDUCED DOWNTIME FOR ENGINES.
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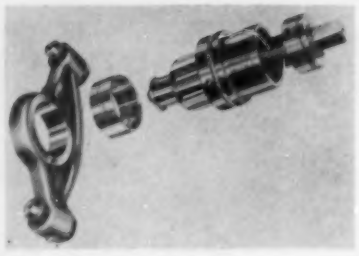
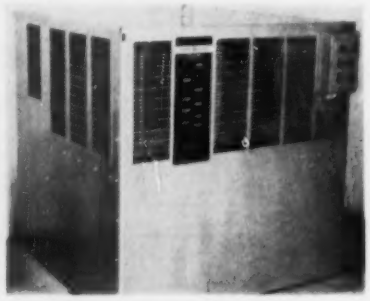


Spinning Tool

This 3-in. rocker arm bushing spinning tool, Model B-4577, was designed for truing and burnishing the inside of rocker arm bushings on diesel locomotives. Similar tools are available for expanding, truing and burnishing sleeves, plugs, bushings, and hubs. *Gustav Wiedeke Company, Dept. RLC, 1833 Richard street, Dayton 1, Ohio.*



Rectifier Power Supply

This 1,540-amp, rectifier power supply, designed for operation on a three-phase 460- or 575-volt input, has an actual output range of 600 to 1,600 amp and can be operated continuously for a 100 per cent duty cycle.

Input voltage is stepped down by a bank of three transformers of the moving coil design, and then rectified by a bank of selenium rectifiers. The coils are motor driven to provide remote current adjustment. Controls for contactor and current output are mounted on the unit's enclosure and can be operated from a remote station.

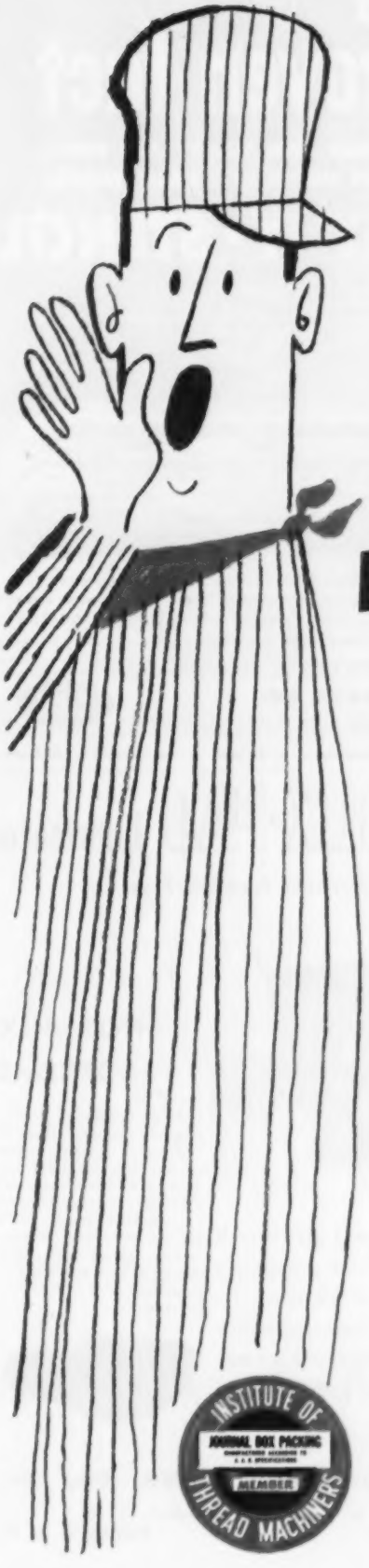
The unit is cooled by two reversible 17¾-hp propeller type fans. Coils, with Class H insulation, are rated for 130-deg C temperature rise. Open circuit voltage is 78 volts, and at full load, the output is rated 40 volts. *General Electric Company, Welding Department, Dept. RLC, Schenectady 5, N.Y.*

Foamed Plastics Dispensing Unit

Assembly line production of cellular foamed plastics for use in building of refrigerated rolling stock has been made possible with the Nopcometer, an automatic metering, mixing and dispensing unit.

The device can deliver to the production

(Continued on page 118)



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	Difference in savings to Railroads.	$ 90,200,000.

This is real economy.

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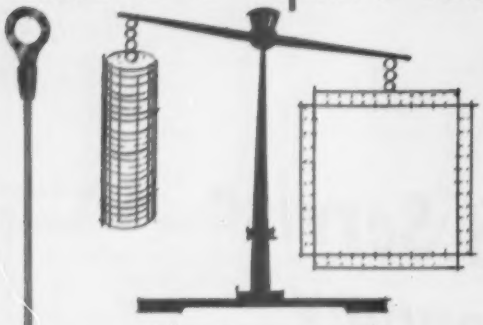
what's a square foot



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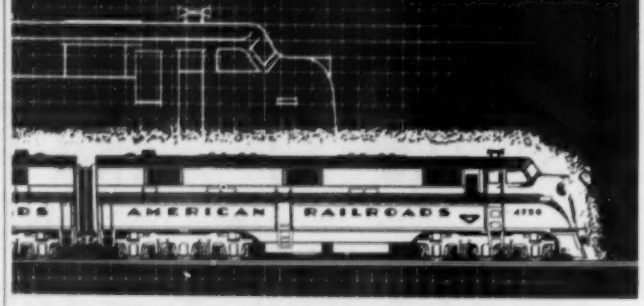

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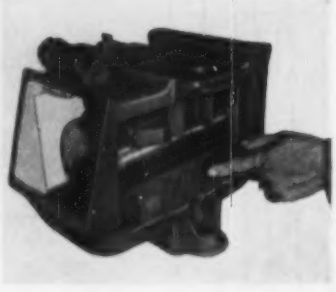
Journal BOX-PAD Lubricator

Reversible Package Type



To solve your

HOT BOX PROBLEMS

Here at last is the answer to the pressing problem of Successful Journal Lubrication, free of Hot Box worries. Our lubricator fits all conventional solid bearing journal boxes, with no modification. Insures positive action with capillary attraction at all times, regardless of Out-Side temperature.

Simple to apply and maintain. It fits snugly against the underside of the journal at all times, regardless of the brake application or side lateral. Eliminates the possibility of waste grab and will NOT glaze.

SEABOARD LUBRICATOR & MFG. CO., INC.

W. J. Sockell, Sr., President

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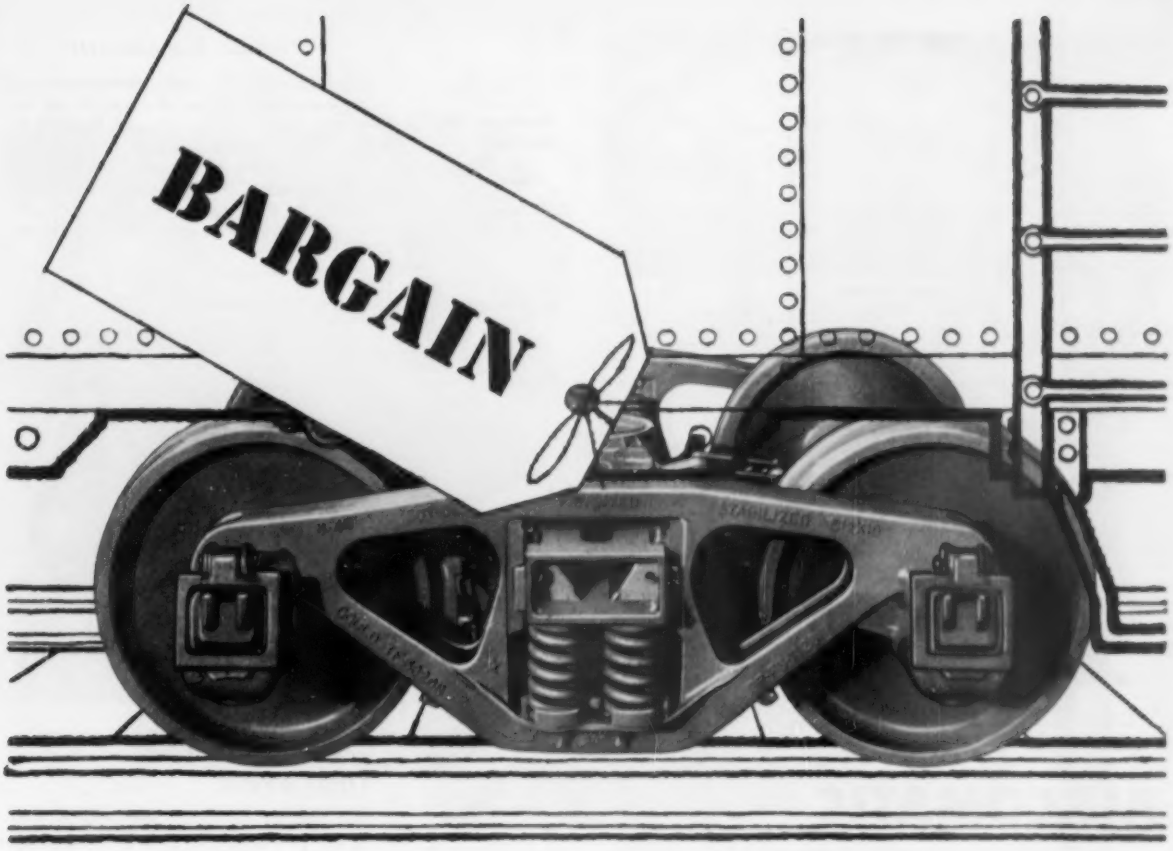

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GIVES SO MUCH PROTECTION

Today Barber Stabilized Trucks are a greater bargain than ever because their savings are greater! Higher speeds mean more chances for costly damage to ladings and equipment.

Barber Stabilized Trucks provide a safe, dependable system of suspension and protection. Actuating springs, friction shoes and wear plates work together as vertical dampers and truck resquaring devices. Bumps and bounces are cushioned and compensated, nosing and violent swivelling prevented. Thousands of damage claims are *completely eliminated;* your equipment is protected; rail pounding and track maintenance are reduced.

We firmly believe that *nothing* you specify does so *much* for your railroad yet costs *so little* as Barber Stabilized Trucks! Standard Car Truck Co., 332 S. Michigan Avenue, Chicago 4, Ill. *In Canada:* Consolidated Equipment Company, Ltd., Dominion Square Building, Montreal 2.

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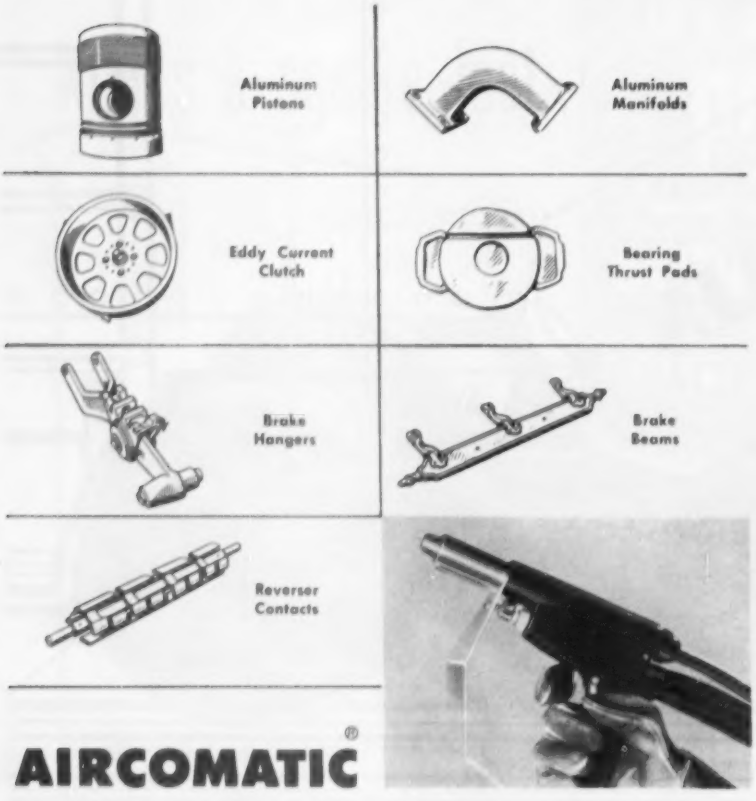

AIRCOMATIC®

reclaims them all

Reclamation of aluminum, steel and bronze diesel engine parts with Aircomatic is fast becoming standard practice in the railroad industry.

Aircomatic welding is an inert-gas, shielded arc process using a consumable wire electrode. The basic unit, manual or automatic, designed and manufactured by Airco, includes the welding head, carriage assembly for wire drive and control equipment, cables, hoses, and flexible wire casing.

Airco shielding gases include both helium and argon, produced by Airco, or mixtures thereof for particular requirements. Pure carbon dioxide gas is also available, from Airco for use as a shielding medium where applicable.

The consumable wire electrode is produced to rigid Airco specifications as to purity, cast, and metallurgical content. Normally supplied on expendable spools, Aircomatic wire is available in alumium, steel, stainless steel, nickel, titanium, copper, and copper base alloys.

Aircomatic is a direct-current welding process. A complete line of Airco motor-generator and rectifier type welders are designed for Aircomatic characteristics—the latest of which is a new constant potential 800 amp ACV welder.

Other Airco inert-gas welding processes include Aircospot and Heliwelding. Write today for details.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

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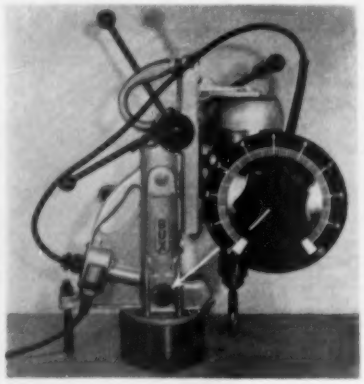
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.

(Continued from page 114)

line, automatically and intermittently, a predetermined charge of foam of any required density at varying rates up to 15 lb per min. The manufacturer believes that the unit will expand the use of foamed plastics as thermal insulating materials in all kinds of refrigerating equipment. *Nopco Chemical Company, Dept. RLC, Harrison, N. J.*



Electro-Magnetic Drill Press

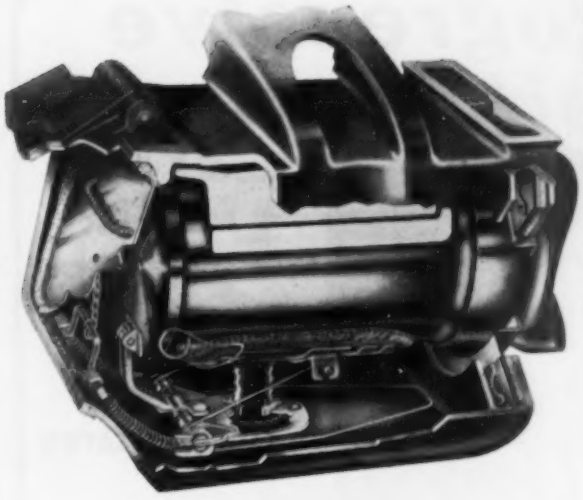
The Bux magnetic drill press, Model V-3, features a rheostat control switch for selecting proper magnetic pull to fit each particular job; a pilot light assembly that floods the drill point area; and a rectifier for converting ac to dc. It is said to materially reduce drilling, reaming and tapping time and costs.

The rheostat switch permits the operator to select amount of magnetic pull for holding the drill while positioning and aligning and for gripping the drill to work piece while drilling, reaming, or tapping. The pilot light assembly not only indicates off and on conditions but increases operator accuracy through concentrated lighting. The more compact arrangement of the rectifier expedites replacement. *Buck Mfg. Co., Dept. RLC, 100 Roberts road, Los Gatos, Cal.*

Ceramic-Tipped Cutting Tool

This cutting tool has an oxide-base ceramic tip bonded to a steel shank and is known as Keramix. It has a lead angle of 7 deg. in a standard size of ½ in. by ½ in. by 3½ in.

When properly ground, the tool is said to produce a fine finish comparable to a commercial grind. In addition, it will cut materials that some other carbide-tipped tools cannot cut. The tool can be operated at slow speeds if desired. No cutting oils are necessary because the tool runs cool and chips will not weld to it. Due to the low thermal conductivity, there is no build-up on the cutting edge and no cratering. *Raybestos Division, Raybestos-Manhattan, Inc., Dept. RLC, Bridgeport, Conn.*



AR TYPE

HENNESSY LUBRICATOR

For Freight Car Journals

- Positive mechanical delivery of oil of any viscosity in sufficient quantity to afford bath lubrication.
- Performance unaffected by heat or cold.
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- Distributor part AR-1 renewal at 3-year intervals.
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- Eliminates hot boxes from usual causes.
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Hennessy Lubricator Co., Inc. has been engaged in the manufacture of mechanical lubricators for journals of railway equipment since 1922.

AR Type Lubricator for freight car journals in use since 1952.

More than 5,000 car sets have been sold; more than half of these have been in interchange service since 1953.

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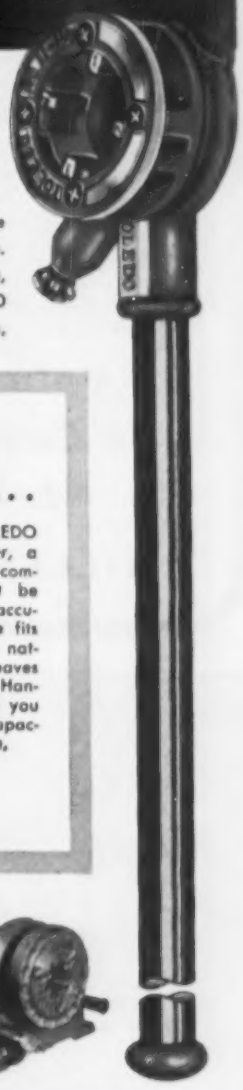
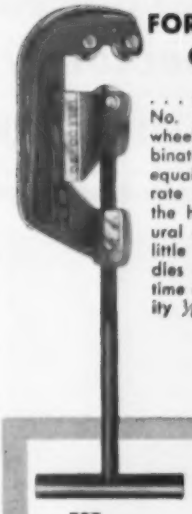
You Thread Pipe . . .



. . . you'll appreciate this popular TOLEDO trio. Pick up the rugged, dependable TOLEDO small Ratchet Pipe Threader. Pull the pawl—drop in a die—you're ready to thread in seconds. You'll like the easier handling, better grip, the famous TOLEDO quality. (⅛ to 2" sizes.) Then,



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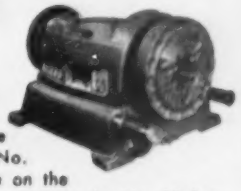
. . . pick up a TOLEDO No. 20 Pipe Cutter, a wheel and roller combination that can't be equalled for fast, accurate cutting. Frame fits the hand for easy, natural grip. Cutter leaves little or no burr. Handles easier to save you time and effort. (Capacity ⅛ to 2".) Then,



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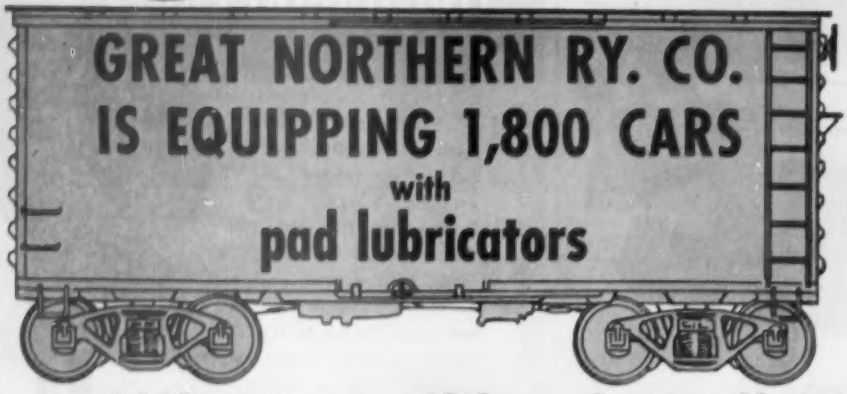

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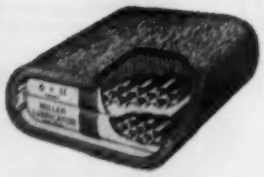

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- *Volume quantities—immediate delivery*
- *Cost—$40 per carset (for all sizes)*
- *Life expectancy—6 years*

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Air-Push motors offer: INSTANT STARTING, MORE POWER, LOWER MAINTENANCE COSTS, RUGGED CONSTRUCTION, COMPLETELY REPLACEABLE PARTS . . . that's why Air-Push equipment is used on more than 90% of all diesel operated locomotives.

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RAILWAY LOCOMOTIVES AND CARS

published monthly at Philadelphia, Pa. for November, 1956.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

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Editor, Harold H. Wilcox, 30 Church St., New York 7, N. Y.

Associate editor, F. N. Houser Jr., 30 Church St., New York 7, N. Y.

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4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

ROBERT G. LEWIS,
Publisher

Sworn to and subscribed before me this 1st day of October, 1956.
EDMUND J. PUYDAK

[SEAL]

(My commission expires March 30, 1958)

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The man in the photo is inspecting an Ex-Cell-O Railroad Pin to make sure it conforms to rigid standards, a tradition at Ex-Cell-O for 25 years. A fraction off in diameter and this pin flunks the test.
Extraordinary care in every step of manufacturing adds extra safety and extra mileage in every hardened and ground steel pin and bushing. A tough, ductile core withstands vibration, while a deep, hard case that is precision ground resists wear and the abrasive effect of substances from the roadbed. This combination gives bonus years of service — often up to a million miles of wear. One of the reasons why over 200 railroads and equipment builders prefer pins and bushings bearing the symbol, XLO.

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Agency—Russell-Berger, Inc.
Armco Steel Corporation 44
Agency—N. W. Ayer & Son, Inc.
Association of Manufacturers of Chilled Car Wheels 96
Agency—Schuyler Hopper Co., The

Bethlehem Steel Company 93
Agency—Jones & Brakeley

Columbia Geneva Steel Division, United States Steel Corporation 35
Agency—Batten, Barton, Durstine & Osborn, Inc.
Crucible Steel Company of America 39
Agency—G. M. Basford Co.

Dana Corporation 107
Agency—Clifford A. Kroening, Inc.
Demp-Nock Co., The 116
Duff-Norton Company 98
Agency—Bond & Starr, Inc.
Du Pont De Nemours & Company (Inc.) E. I., Petroleum Chemicals Division 34
Agency—Charles L. Rumrill Co., Inc.

Edgewater Steel Co. 7
Agency—Downing Industrial Advertising, Inc.
Elastic Stop Nut Corporation of America 97
Agency—G. M. Basford Company
Electro-Motive Division, General Motors 31
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.
Enterprise Railway Equipment Co. 5
Agency—Merrill, McEnroe & Assoc.
Esso Standard Oil Company 95
Agency—McCann-Erickson, Inc.
Ex-Cell-O Corporation 121
Agency—Holden, Chapin Larue, Inc.
Exide Industrial Division-Electric Storage Battery Co., The 24
Agency—Gray & Rogers

Fine Organics, Inc. 106
Agency—Conti Advertising

Garlock Packing Company, The 94
Agency—Hutchins Advertising Co., Inc.
Garrett Corporation, The 38
Agency—J. Walter Thompson Company
General Electric Co. 14, 15, 108, 109
Agency—G. M. Basford Company
General Steel Castings 33
Agency—Oakleigh R. French & Assoc.
Griffin Wheel Company 42, 43
Agency—Erwin, Wasey & Co., Inc.
Gulf Oil Corporation 22, 23
Agency—Ketchum, MacLeod & Grove, Inc.

Hennessy Lubricator Co., Inc. 119
Holland Company 46
Agency—Van Auken, Ragland & Stevens
Hyatt Bearings Division of General Motors 47
Agency—D. P. Brother & Co., Inc.

Ingersoll-Rand 102, 103
Agency—Beaumont, Heller & Sperling, Inc.
Institute of Thread Machiners, Inc. 115
Agency—John Mather Lupton Company
International Steel Company 25
Agency—W. S. Kirkland Advertising

Journal Box Servicing Corporation 45

Klockner-Humboldt-Deutz A. G. Koln-Deutz 112

Lewis Bolt & Nut Company 26
Agency—E. T. Holmgren, Inc.
Linde Air Products Company, a Division of Union Carbide and Carbon Corporation 30
Agency—J. M. Mathes, Inc.
Locomotive Finished Materials Company 27
Agency—Potts-Woodbury, Inc.

MacLean-Fogg Lock Nut Company 105
Agency—W. S. Kirkland Advertising
Magnaflux Corporation 110
Agency—Stoetzel & Associates, Inc.
Magnus Chemical Co., Inc. 100
Agency—Brudno & Bailey
Magnus Metal Corporation 32, 54
Agency—Marsteller, Rickard, Gebhardt, & Reed, Inc.
Met-L-Wood Corporation 18
Agency—Armstrong Advertising Agency
Miller Lubricator 120
Agency—Kerker-Peterson Hixon-Hayes
Miner, Inc., W. H. ..... Front Cover
Motor Wheel Corporation, T-Z Railway Equipment Co. 101
Agency—Jepson Murray, Advertising

National Aluminate Corporation ..... Inside Back Cover
Agency—Armstrong Advertising Agency
National Carbon Company, A Division of Union Carbide and Carbon Corporation 20, 21
Agency—William Esty & Co.
National Malleable and Steel Castings Company ... 16, 17
Agency—Palm & Patterson, Inc.
National Tube Division, United States Steel Corporation 35
Agency—Batten, Barton, Durstine & Osborn, Inc.
New York Air Brake Company, The 99
Agency—Humbert & Jones

Oakite Products, Inc. 1
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.

Rust-Oleum Corporation 41
Agency—O'Grady, Andersen & Gray, Inc.

Seaboard Lubricator and Manufacturing Co. 116
Simplex Wire & Cable Co. 19
Agency—Henry A. Loudan, Inc.
Sinclair Refining Company 36, 37
Agency—Morey, Humm & Johnstone, Inc.
Sprague Devices, Inc. 120
Agency—Tri-State Advertising Company, Inc.
Stackpole Carbon Company 104
Agency—Harry P. Bridge Co.
Standard Car Truck Company 117
Agency—Stuart Potter Co.
Stran-Steel Corporation, Unit of National Steel Corporation 111
Agency—Campbell-Ewald Co.
Sweeney Mfg. Co., B. K. 120
Agency—Curt Freiberger & Co.

Texas Company, The 50
Agency—Erwin, Wasey & Company, Inc.
Timken Roller Bearing Company, The .... Back Cover
Agency—Batten, Barton, Durstine & Osborn, Inc.
Toledo Pipe Threading Machine Co., The 119
Agency—The Jay H. Maish Co.

United States Graphite Company, The 113
Agency—Price, Tanner & Wilcox, Inc.
United States Steel Corporation, United States Steel Export Company 35
Agency—Batten, Barton, Durstine & Osborn, Inc.
Unit Truck Corporation ..... Inside Front Cover

Van Der Horst Corp. 114

Waugh Equipment Company 11
Westinghouse Air Brake Company 52, 53
Agency—Batten, Barton, Durstine & Osborn, Inc.
Wine Railway Appliance Co., The 91
Agency—T. J. Stead, Advertising
Wix Corporation 9
Agency—Humbert & Jones

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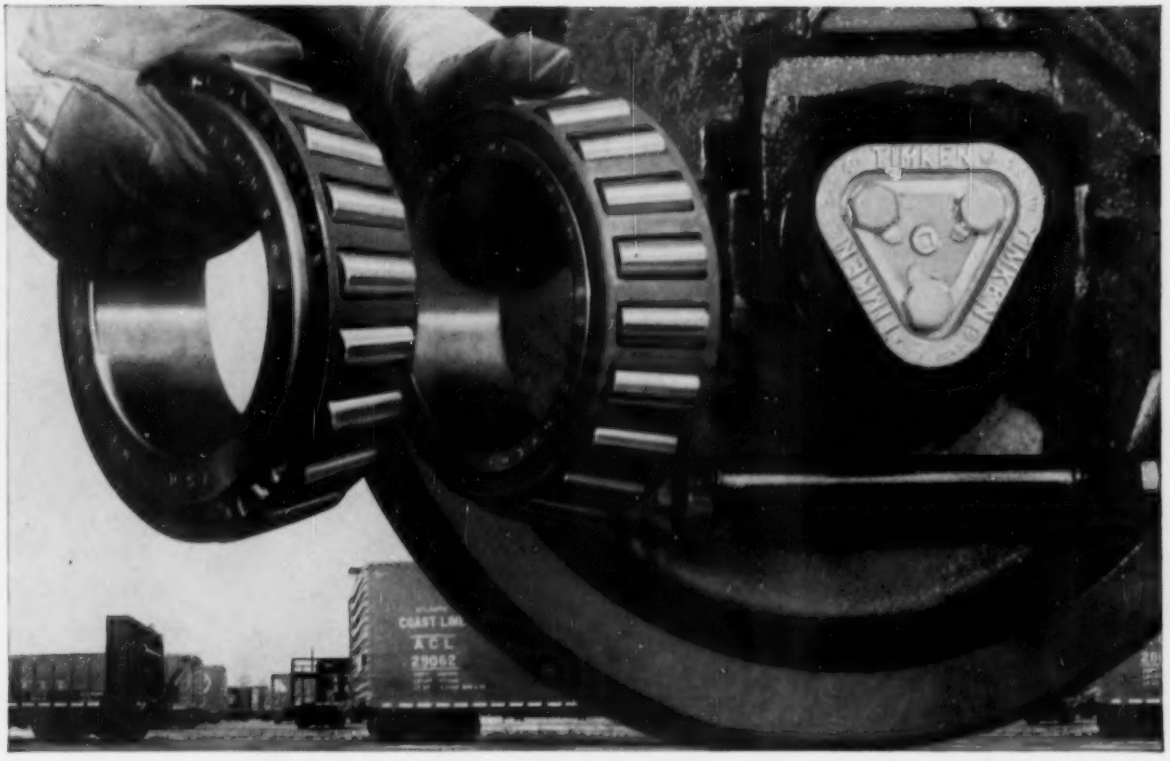

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WHEN Atlantic Coast Line orders 1,800 *more* freight cars equipped with Timken® tapered roller bearings, ACL knows what it's doing. They've seen the savings. As experienced railroaders, Atlantic Coast Line knows that Timken bearings bring savings in operating costs—pay a good return on the investment in roller bearings. And they know how faster deliveries by "Roller Freight" help railroads get more business.

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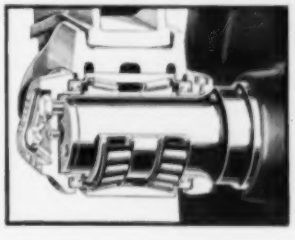

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